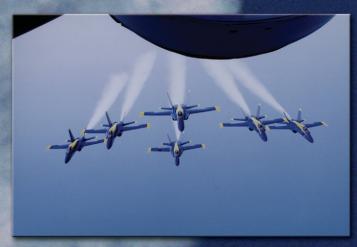


Volume 23, No. 3 March 2004

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Monitoring Times Rir Show Spectaculari





Show schedules, frequencies, equipment, listening tips and more

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Bandwidth: 1 Hz to 15 kHz

continuously variable in 1 Hz increments

Sensitivity: $0.25 \,\mu\text{V} \text{ (AM, 10dB S/N)}$

S-meter sensitivity: $0.1~\mu V$



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Vol. 23, No. 3

March 2004



Cover Story

On Scene Monitoring at Air Shows

by Ken Windyka

Air shows provide excitement and variety for young and old alike. An air show may range from a small exhibition with limited aerial performers and static aircraft displays to a large military base air show or open house with aerial performers plus large static displays of military and civilian aircraft, including World War II "war bird" displays.

The scanner hobbyist has a very distinct advantage over the general public at air shows. Not only can he see the action, but he can hear the radio transmissions directly related to the aerial performance, as well as the various support radio communications for the entire air show. Story starts on page 12.

On our Cover: photos by Kevin Burke, photoz01@netzero.com

Day	rton's	Biaaes	t and Bes	ł 1 d	7

By Kevin Burke

Last year the author attended one of the biggest airshows ever held at Dayton International Airport, near Wright Patterson Air Force Base. Here's a photoplay of the action and his impressions. This could be you, watching the action this summer!

Radio France International19

By Luc Gougeon

RFI is the voice of France abroad, directed toward expatriates, former colonies, and French-speakers worldwide. RFI also broadcasts in 19 other languages, primarily directed toward Africa and the Middle East. A station that is always open to new ideas, Radio France finds itself exploring new methods of transmitting while still dependent on analog technology. In this tour of RFI headquarters, the author finds RFI friendly, welcoming, and a station one should keep one's eye on for the future.

Is It Broadcasting or Datacasting?.....22

By D Prabakaran

In the digital world, broadcasting, communications, data, and video can make use of the same wires, optic fiber, or radio carrier. Content is not dependent on the media, and consumers have a variety of media options for the same content. In the new world of Digital Audio Broadcasting (DAB), there are two standardized modes – Eureka 147 and IBOC. The author explains the differences and strong points of each system and their basics.

Sunday and the Philco......24

By Greg Petro

In this word picture we are taken back into our childhood when the world of grown-ups was somehow mysterious and intimidating – and a memory of being invited in, briefly, over a radio program.

Monitoring Military Flight Demonstration Groups . 64

Milcom's annual frequency, equipment, and schedule column. Here's where you get the frequencies to go with the great pictures in our feature stories.

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MONITORING TIMES (ISSN: 0889-5341; Publishers Mail Agreement #1253492) is published monthly by Grove Enterprises, Inc., Brasstown, North Carolina, USA.

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Address: 7540 Highway 64 West, Brasstown, NC 28902-0098

Telephone: (828) 837-9200 (828) 837-2216 (24 hours) Fax: Internet Address:

www.grove-ent.com or e-mail: mt@grove-ent.com

Editorial e-mail: editor@monitoringtimes.com **Subscriptions:** order@grove-ent.com

Subscription Rates: \$28.95 in US; \$39.50 Canada; and \$58.50 foreign elsewhere, US funds. Label indicates last issue of subscription. See page 91 for subscription information.

Send address changes to Monitoring Times, 7540 Highway 64 West, Brasstown, NC

While Monitoring Times makes an effort to ensure the information it publishes is acculished in Monitoring Times. Opinion or view of Monitoring Times or Grove Enter-

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Reviews:

Grundig's new YB-550PE is an attractive addition to the versatile Yacht Boy line, combining an AM/FM and shortwave receiver in a lightweight, compact radio. Reviewer Gayle Van Horn discovered surprisingly good reception on all bands for an affordable portable (p82).

The Sounds Sweet speaker makes a lot of claims about its performance as an accessory speaker. Bob Grove puts it through its paces and compares performance to hype - and also compares it to a speaker half the price. Sounds Sweet comes off very well in the comparison – depending on what kind of listening you want to do and where (p.82).

A second shortwave radio reviewed this month is Kaito's KA1102 portable, multiband, dual-conversion radio. Bob Grove checks this

one out and finds it equally impressive, with everything you could want in a "full-featured" shortwave portable for under \$100 (p.83).

John Catalano is flying high with AirNav's new ACARS Decoder 2 - one of the best ACARS programs he has used (p.80).

Here's a great gadget – **PC NoteTaker** from Pegasus America is designed to quickly capture handwritten notes and drawings and make them instantly accessible on your personal computer. Don't believe it? Check out the Gadget Guy on page 86.

In addition to some useful construction projects, Scanning Equipment features a reader's real-world evaluation of the Radio Shack PRO-96 versus equivalent scanners (p.79).

Second Departments

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THE VERY BEST IN SHORTWAVE RADIOS



YB 400PE AM/FM/ Shortwave Radio

This high-performance PLL synthesized, dual-conversion YB 400PE receiver pulls in AM, FM-Stereo, Shortwave, and Longwave, including continuous coverage from 520-30,000 KHz. Even Ham radio two-way communications can be heard using the SSB circuitry. Its highly sensitive auto-tuning system stops even on weak stations within the international Shortwave broadcast bands. Its 40 programmable memory presets allow quick, easy access to your favorite st tions. **Key features include:**

- Easy tuning with direct frequency entry, up/down buttons, and auto-scan
- Multifunction LCD displays time, frequency, band, alarm wake time, and sleep timer
- Sleep timer, dual clocks, and dual alarm modes wake you with beeper or radio play
- Built-in antennas for complete portability and socket for supplementary Shortwave antennas
- Includes AC adaptor, earphones, carrying pouch, supplementary Shortwave wire antenna, and batteries

 \$149.95



S350 AM/FM/ Shortwave Radio

Incorporating a sensitive, high-performance analog tuner with digital frequency readout, the S350 receives AM, FM-Stereo, and continuous Shortwave coverage of 3,000 to 28,000 KHz, including all 14 international broadcast bands. Its classic analog tuning knob with superimposed fine-tuning control makes it a pleasure to operate, and the variable RF gain control, wide/narrow bandwidth selector and low pass filter give you complete control over incoming signals. Operates on 4 'D' batteries for long battery life. **Key features include:**

- Multifunction LCD shows digital frequency, dock, and more
- Alarm and 1-90 minute sleep timer
- Variable, independent bass and treble controls
- Left/right line-level outputs (stereo in FM)
- Includes built-in antennas, sockets for supplementary Shortwave and FM antennas, convertible nylon handle/carrying strap, earphones, and optional AC adaptor

YB 550PE AM/FM/ Shortwave Radio

Unique features define the model YB 550PE, such as 200 randomly programmable memory presets with user-defined memory page customizing, digital fine-tuning control, and favorite station wake-up memory. Through its PLL synthesized digital tuner, receive AM, FM-Stereo, and Shortwave with excellent sensitivity and selectivity. Enjoy the entire Shortwave spectrum that includes all 14 international broadcast bands and continuous Shortwave coverage of 520-29,999 KHz. Its auto-tuning system stops even on weak stations within the international Shortwave spectrum, or with the direct frequency entry system, go instantly to any frequency in its tuning range. Key features include:

- Signal strength and battery power level indicators
- Digital clock with selectable 12/24 hour clock display format
- LCD with display light that shows simultaneous display of frequency and clock
- Alarm with snooze feature and 10-90 minute sleep timer
- Includes built-in antennas, sockets for supplementary Shortwave and FM antennas, earphones, and optional AC adaptor



FR200 AM/FM/ Shortwave Emergency Radio

Requiring no external power source, the FR200 is a versatile multi-purpose tool for keeping informed, entertained, and safe. Combining AM/FM/Shortwave radio and flashlight in one, the FR200 operates without batteries — powered by its built-in hand-crank generator — allowing you to listen to news, music, and international programming from anywhere, including places where power is a problem. **Key features include:**

- AM/FM/Shortwave Tuning (SW1, 3.2-7.6MHz; SW2, 9.2-22MHz)
- Hand-crank power generator recharges internal Ni-MH battery
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- Can also operate on 3 AA batteries or optional AC adaptor

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The Most Powerful Compact Shortwave Radios in The World.





Radio Frustrations

In response to the January Communications column item entitled "Firefighting Radio Frustrations," we received the following response from Bob Studer, which seems particularly appropriate in light of this month's Closing Comments on interoperability.

"I find this article very ironic in that, at every major incident/disaster, the same problems have occurred with communications [or lack thereof] on a predicted basis. This occurs when agencies from different sectors and localities of government are not able to communicate with each other. It occurred at hurricane Andrew, the Oklahoma City incident, and the World Trade Center, to mention a few. Then after the fact, there are meetings after meetings to try to figure out what happened and attempt to fix the prob-

"One would think that by now, the techs and experts would have solved the problem, but I will guarantee that when the next incident occurs, it will be a mirror image of the past. Fact: every solution breeds a new problem, and can anyone dare imagine what a mess a statewide or regional incident or disaster would become?

"Problems are: lack of common sense, backup equipment and resources, and long term planning; each agency being self-centered to their own needs, and sales people not considering the big picture. Interesting how all the latest high tech systems operate just fine on a regular daily basis for local emergencies, but when subjected to a need beyond that, the sales people will say that, 'the system was not designed and or intended for this application.' Excuse me, but isn't that what a reliable system should be designed for?

"It is ludicrous to believe that local, county, state and federal agencies will ever be capable of communications to satisfaction, and the general public will once again be duped. However, most could care less: just respond and take care of our needs when an emergency occurs. In my humble opinion, with trunked systems relying on computers, repeaters, and towers and with emergency power sources that are often not checked [on schedule] for backup, we have set ourselves up for failure. We have come to rely on the latest unreliable systems by the manufacturers and

"I have been around the emergency services before radios and incident command systems were in use or even thought of, and I wonder if anyone has ever considered how fires and incidents were handled. - prior to radio communications? They did it with the use of common sense, obviously uncommon today, and good leadership...not from [behind a desk] management. Maybe some tried and true evolutions should be part of the 'mock incident' training of course 'just in case' the high-tech systems should fail – next time. This is a good example why the 'tried and true' Amateur Radio Service

is and always will be there when the chips are down next time. Just hide 'n watch....

- Bob Studer - N5VMP, Arlington, TX

Streaming Scanners

"I'm a subscriber and have been for many years. I always look forward to and enjoy each new monthly issue! You all are doing a FAN-TASTIC job!

"I read with interest the information in regard to HIPAA and how it applies to live stream scanner audio such as those currently available on Shoutcast. (Monitoring and the Law, Jan 2004) I listened more closely to a local EMS response with HIPAA in mind and was really amazed at just how much patient information is exchanged... such as the patient's name, address, medical problem(s), medical history, medications being taken, treatment... etc.

"In fact... the article prompted me to change my format from the Lee County FD/PD/EMS trunked system(s) here in Ft. Myers, Florida, to air/ham/marine. I sure made some 'airplane folks' happy... but I've also heard the wrath from those who prefer listening to PD, FD and EMS chan-

"How about another article in the future when more information becomes available for us that live stream our scanners to the world?!"

- Ralph Stallsworth, N. Ft. Myers, FL http://stallsworth.home.comcast.net/radio.htm

Scanning in South Dakota

"Terrific article on SD scanner statutes! (Monitoring and the Law, Vol 22, No12). I was aware of portions of 23-4-5 but not the part that specifically restricts 'possession' of a receiver in a vehicle. I have certainly unknowingly violated that statute many times while visiting SD as a tourist. Never been caught....would have played dumb!

"Now AWARE! I am somewhat concerned with what the word 'possess' is defined to be in SD law. Can the radio be transported....in the trunk of a vehicle....in the back seat? If an ounce or two of cocaine is in my trunk... am I not in possession? Does the same apply to a radio....if it is in my luggage?

"Am I and other scannists no longer welcome as tourists in SD? Perhaps those of us wishing to travel to Aberdeen, SD, should write their police department requesting a 'visitor permit' for safe passage of our radio equipment through their jurisdiction. Others may wish to contact other SD localities wishing to comply with the state's wishes of controlling our hobby.. Does Custer SD have a police department?

"I'm sure everyone of us could simply take the FCC ticket test and attempt to circumvent this law or those like them in the other 6 states who restrict mobile use/possession/transport of a scanner to some degree. However, since we only desire to listen and not transmit....Why should scannists be asked to dilute the amateur



Below 500 kHz columnist Kevin Carey says, "Shhhh...Don't tell anyone, but this weekend I operated above 30 MHz! Attached are some photos of my son, Bryan (left) and his friend Ray Dreimiller who helped me out during the ARRL VHF Sweepstakes event. We worked the 6m, 2m, and 70 cm bands, and got into PA, OH, Bermuda (VP9!) and Ontario! Bryan and Ray are currently enrolled in a ham class, and hope to obtain their tickets in the spring.

radio hobby (as welcoming as its membership can be)? I've never been able to find a spot to plug in a microphone on any of my scanners....but I'd still like to be compliant with this SD law if possible."

- Mark Bajek, Westland, MI

Mark emailed his questions to the South Dakota Attorney General and received a prompt reply. Mark comments, "No answers to the permit question other than, no YOU can't use a scanner in a car.....and NO we don't offer permits. But they do seem to say it can be stowed in one's luggage and be transported through the state of SD." Here's the official reply:

Mr. Bajek:

First, it is the policy of the Attorney General to not answer speculative "what if" questions, especially in situations where we would be guessing on how a law enforcement officer in the field would react. Different officers would react differently to each of your scenarios. Second, South Dakota law does not allow us to issue you a permit or to give you permission to use a scanner in your motor vehicle. Permits are only authorized for fixed units in authorized places of business, and available from the law enforcement agency (you mentioned police or fire) whose frequencies you intend to monitor. Below is the applicable statute.

23-4-5. Unlawful possession of receiving set or converter without permission - Seizure by peace officer. The possession of any receiving set or converter described in § 23-4-2 in any vehicle or business establishment, without permission pursuant to § 23-4-3, will constitute prima facie evidence of possession for unlawful purposes, and such receiving set shall be deemed contraband and shall be confiscated by any peace officer of this state and delivered to the attorney general for disposition.

Our best advice to you, is to have your scanner stored in a location where you cannot use it while traveling in South Dakota. We hope you enjoy your trip and especially your time in South Dakota.

Charles D. McGuigan Assistant Attorney General 500 East Capitol Avenue Pierre, SD 57501-5070

To the Propagation Prof

Dear Tomas,

"Thank you for your very informative article on winter propagation in the November 2003 issue of Monitoring Times. One of the science teachers at the school where I work has been giving the faculty regular updates on solar activity this fall, so I was especially interested in how these events would be affecting propagation on the SW and higher frequencies. Your description of what's going on was well organized and very helpful.

"I can't wait to start throwing around terms

like 'auroral zone,' 'magnetosheath,' and 'Kp Index' in casual conversations."

> - Tim Doyle WB2QMA, Dean of Students, The Lawrenceville School, Lawrenceville, NJ

SWL Callsigns

Glenn Hauser forwarded the following email he received from Donna Slaughter in response to the lead story in Global Forum, December 2003 issue of Monitoring Times.

"I thoroughly enjoy MT and read it from cover to cover each month. This is the first time I have ever felt the need to write. The article on the SWL callsigns struck home with me as I have my original certificate signed by Hank Bennett on October 1, 1987. It is titled 'All-Band Radio Monitor Certificate of Registration.' Quite attractive with a red border. My name and monitoring location is listed on it and the callsign issued to me is 'WDX9KBM'. Hank Bennett's callsign is WDX2FT. It is also signed by Amelia J. Greenwald, WDX2BA.

"I do not agree with Duane Fischer that these callsigns served no other purpose than for personal ego, nor was it a SW 'gimmick' to make SWLs feel special. I can tell you from personal experience that QSLing SW stations got me a faster response whenever I used the callsign. Also, in many cases, I got a response when others did

"Nor do I agree with Damon Cassell that shortwave is a dying hobby. I listen almost every day. I started in the hobby in 1971, then got my Amateur Radio license in 1989. Don't get me wrong, I'm proud of my Ham license, but I will continue to be a SWL till I die.

"Thanks for reading this and thanks for a wonderful magazine. Keep up the good work." - Donna Slaughter, Amateur-N9HYI, SWL-proudly, WDX9KBM

February Correction

On page 12 of "Monitoring the South American Military" a digit was dropped in the last frequency in the Planets net: it should have read 10135.0. Our apologies also to author Ron Perron for the misspelling of his name.

MT Covers

"Just wish to comment about the great covers on the MT magazine every month. The "Fury of Fire" was truly captured on the January cover with its vivid colors. Splendid job! All the best in 2004."

- Al Zupan

Thanks, Al. *Monitoring Times* is always looking for good cover photos – Do you have a candidate in your archive?

We welcome your ideas, opinions, corrections, and additions in this column. Please mail to **Letters to the Editor,** 7540 Highway 64 West, Brasstown, NC 28902, or email editor@monitoringtimes.com. Letters may be edited for length and clarity.

Happy monitoring! -Rachel Baughn, KE4OPD, editor

MORE BOOM FOR YOUR BUCK!



Antenna Crossarm Boom (Design 1)

With 4-ft. or 2M (78-3/4") lengths, and designed for mast or tower, static or marine mountings, this boom fits the bill! Unique structural platform mounts four magnetic-base mount antennas OUT AND AWAY from mast or tower.

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Four Foot Steel with four different antennas pictured above. Other uses include a versatile Meteorological sensor platform, surveillance cameras and supports for Photographic and studio lighting. Stacked arrays have multiple Military applications: amphibious operation voice and code communications plus RDF.

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4. Two Meter Al (78-3/4") Grey (large thin 5" pads) 7.5#\$349.00
5. Two Meter Al (78-3/4") Grey (large thick 5" pads) 9.8#\$369.00
6. Two Meter Stainless Steel (small thick 4" pads) 20.3# \$599.00

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Kentucky Scanners: Use It and Lose It

n a few weeks on May 1st, the 130th running of the Kentucky Derby at Churchill Downs – Home of the Kentucky Derby near Louisville – will take place. Some of the visitors to this event, and certainly much of the media covering it, bring scanners to the event, but many are unaware of Kentucky's new anti-scanner law. Racing enthusiasts who visit the new Kentucky Speedway in Sparta about 40 miles southwest of Cincinnati, are even more likely to be unaware of the law revised by the Kentucky legislature in 2000, the same year the Speedway opened.

According to Mark Bajek, motorsports enthusiast and contributor to *The Paddock* (http://motorsports.thepaddock.com), a web site that caters to the motorsports fan and includes information on race scanning, visitors to Kentucky should be aware that "...officers are duly sworn to confiscate and destroy the radio on the spot." *The Paddock* in fact warns its readers, "[b]efore taking your scanner to a race, be sure you are familiar with the laws of the state you are visiting regarding the use of radio scanners." (See also Mark's "Letter to the Editor" on page 6.)

The actual text of the law in Kentucky that makes it illegal to possess a police scanner can be found at 432.570 entitled Restrictions on possession or use of radio capable of sending or receiving police messages. It states that: "(1) It shall be unlawful for any person except a member of a police department or police force or an official with written authorization from the head of a department which regularly maintains a police radio system authorized or licensed by the Federal Communications Commission, to have in his or her possession, or in an automobile or other vehicle, or to equip or install in or on any automobile or other vehicle, any mobile radio set or apparatus capable of either receiving or transmitting radio or other messages or signals within the wave length or channel now or which may hereafter be allocated by the Federal Communications Commission, or its successor, for the purpose of police radios, or which may in any way intercept or interfere with the transmission of radio messages by any police or other peace officers."

The law goes on to prohibit police scanners in certain vehicles. "It shall be unlawful for any car, automobile, or other vehicle other than one publicly owned and entitled to an official license plate issued by the state issuing a license for the car, to have, or be equipped with the sets or apparatus even though the car is owned by an officer. This section shall not apply to any automobile or vehicle owned or operated by a member of a sheriff's department authorized by the fiscal court

to operate a radio communications system that is licensed by the Federal Communications Commission or other federal agency having the authority to license same."

Probation and parole officers are excluded since, "[n]othing in this section shall preclude a probation and parole officer employed by the Department of Corrections from carrying on his person or in a private vehicle while conducting his official duties an authorized, state-issued portable radio apparatus capable of transmitting or receiving signals."

Kentucky Penalties

Section 2 for the law states its penalties and provides that any person found guilty of violating any of the provisions of this section shall be guilty of a misdemeanor, and, upon conviction, shall be punished by a fine of between fifty dollars (\$50) and five hundred dollars (\$500), and / or imprisonment up to twelve (12) months.

Kentucky authorities are authorized by the



law to seize and ultimately destroy the police radio or scanner at issue, since the law provides that it shall be the duty of any and all peace officers to seize and hold for evidence any and all equipment used in violation of the provisions of this section, and, upon conviction of the person having, equipping or using such equipment, it shall be the duty of the trial court to order such equipment or apparatus destroyed, forfeited, or escheated to the Commonwealth of Kentucky.

Therefore, Mark Bajek's advice to motorsport entusiasts is accurate, since the law provides without much explanation that police scanners and radios "may be ordered destroyed, forfeited, or escheated as above provided without a conviction of the person charged with violat-

ing this section" (emphasis added).

♦ Other Exemptions

The anti-scanner law in Kentucky has many of the usual exceptions seen in other state's laws. including licensed ham radio operators. "Nothing contained in this section shall prohibit the possession of a radio by: (a) An individual who is a retailer or wholesaler and in the ordinary course of his business offers such radios for sale or resale: (b) A commercial or educational radio or television station, licensed by the Federal Communications Commission, at its place of business; or (c) An individual who possesses such a radio, provided it is capable of receiving radio transmissions only and is not capable of sending or transmitting radio messages, at his place of residence; licensed commercial auto towing trucks; newspaper reporters and photographers; emergency management agency personnel authorized in writing by the director of the division of emergency management (for state personnel) or chief executive of the city or county (for their respective personnel); a person holding a valid license issued by the Federal Communications Commission in the amateur radio service; peace officers authorized in writing by the head of their law enforcement agency, Commonwealth's attorneys and their assistants, county attorneys and their assistants."

And then the Kentucky law adds what should have been the law here all along and what seemingly sticks out like a sore thumb in this part of the statute – "except that it shall be unlawful to use such radio to facilitate any criminal activity or to avoid apprehension by law enforcement officers." And again the law reminds folks that a "[v]iolation of this section shall, in addition to any other penalty prescribed by law, result in a forfeiture to the local law enforcement agency of such radio." Kentucky really wants to take away those illegal radios.

continued on page 27

Disclaimer

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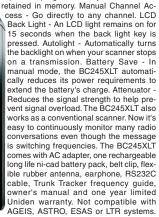
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COMMUNICATIONS

ARRL Proposes Entry-Level License, Code-Free HF Access

The ARRL will ask the FCC to create a new entry-level Amateur Radio license that would include HF phone privileges without requiring a Morse code test. The League also will propose consolidating all current licensees into three classes, retaining the Element 1 Morse requirement – now 5 WPM – only for the highest class. The ARRL Board of Directors overwhelmingly approved the plan January 16 during its Annual Meeting in Windsor, Connecticut.

The proposals – developed by the ARRL Executive Committee following a Board instruction last July – are in response to changes made in Article 25 of the international Radio Regulations at World Radiocommunication Conference 2003 (WRC-03). They would continue a process of streamlining the amateur licensing structure that the FCC began more than five years ago but left unfinished in the Amateur Service license restructuring Report and Order (WT 98-143) that went into effect April 15, 2000.

The "New" Novice

The entry-level license class – being called "Novice" for now – would require a 25-question written exam. It would offer limited HF CW/data and phone/image privileges on 80, 40, 15 and 10 meters as well as VHF and UHF privileges on 6 and 2 meters and on 222-225 and 430-450 MHz. Power output would be restricted to 100 W on 80, 40, and 15 meters and to 50 W on 10 meters and up, thus avoiding the need for the more complex RF safety questions in the Novice question pool.

Anticipating assertions that the new plan would "dumb down" Amateur Radio licensing, ARRL First Vice President Joel Harrison, W5ZN, said those currently holding a ticket often perceive the level of complexity to have been greater when they were first licensed than it actually was. "Quite frankly," he said, "if you review the questions presented in our license manuals throughout the years, you will be surprised how they compare to those of today."

"This structure provides a true entry-level license with HF privileges to promote growth in the Amateur Service," Harrison said. "It also simplifies the FCC database by conforming to the current Universal Licensing System (ULS) structure and does not mandate any modifications to it."

ARRL CEO David Sumner, K1ZZ, and Harrison say the current Technician entry-level ticket provides little opportunity to experience facets of ham radio beyond repeater operation. "The quality of that experience," Sumner said, "often depends on the operator's location."

Among other advantages, Sumner said the plan would allow new Novices to participate in HF SSB emergency nets on 75 and 40 meters as well as on the top 100 kHz of 15 meters. The new license also could get another name, Sumner said. "We're trying to recapture the magic of the

old Novice license, but in a manner that's appropriate for the 21st century."

Technicians, Generals, and Extra

The middle group of licensees – Technician, Tech Plus (Technician with Element 1 credit) and General – would be consolidated into a new General license that no longer would require a Morse examination. ARRL already has proposed additional phone privileges for Generals in its "Novice refarming" petition, RM-10413, but the FCC has not yet acted on that petition.

At the top rung, the Board indicated that it saw no compelling reason to change the Amateur Extra class license requirements.

Hard Hit for Hubble

Two days after President Bush ordered the National Aeronautics and Space Administration to redirect its resources toward human exploration of the Moon and Mars, the agency's administrator, Sean O'Keefe, told the managers of the space telescope that there would be no more shuttle visits to maintain the Hubble Space Telescope – one of NASA's most celebrated successes.

A visit by astronauts to install a couple of the telescope's scientific instruments and replace the gyroscopes and batteries had been planned for next year. Without any more visits, the 10year-old telescope will probably die in orbit.

"It could die tomorrow, it could last to 2011," said Dr. Steven Beckwith, director of the Space Telescope Institute on the Johns Hopkins University campus in Baltimore. The demise of the Hubble will leave astronomers with no foreseeable prospect of a telescope in space operating primarily at visible wavelengths.

Dr. David N. Spergel, an astronomer at Princeton and a member of a committee that advises NASA on space science, called it a "double whammy" for astronomy. Not only was a telescope being lost, but \$200 million worth of instruments that had been built to be added in the later shuttle mission will also be left on the ground, Dr. Spergel said.

The decision came on the heels of Mr. Bush's directive to NASA to reallocate \$11 billion of its resources over the next five years into returning people to the Moon. Triple whammy. Trouble is, NASA is still committed to bringing Hubble back to Earth safely after its useful life ends.

Until the *Columbia* accident, NASA had planned to retrieve the telescope with a shuttle and put it in the Smithsonian. But since the shuttle is no longer allowed to travel to the Hubble, for safety reasons, the plan is now to build a robotic rocket that would go up, attach itself to the telescope, fire its engine to brake Hubble out of orbit and drop it in the ocean. The cost of developing the rocket? \$300 million or more, to also come out of the NASA astronomy budget. Make that whammy a quadruple!

You Want Insults with That?

Drive-through customers at the Burger King in Troy, Michigan, were treated to more than fries with their orders on several occasions in January. Many received insults and obscenities over the speaker, presumably from someone using a radio transmitter or walkie-talkie and hiding close enough to watch the reaction. No word on whether the heckler has been apprehended. Illegal use of a telecommunications device is a misdemeanor in Troy, carrying up to three months in jail plus fines.

No Hiding Place

Recently, wireless companies have been putting into place expensive upgrades under a federal mandate requiring that cell carriers be able to pinpoint the whereabouts of any customer who calls 911 during an emergency – and they're anxious to find a commercial application to turn their investment into a profit. Such commercial use could include the ability for restaurants and other businesses to send a solicitation by text



March 12-13: Kulpsville, PA

17th annual Winter SWL Festival (Winterfest) sponsored by NASWA at the Best Western Inn at Towamencin (1750 Sumneytown Pike, Kulpsville, Pennsylvania 19443 (215) 368-3800). Friday and Saturday forums include discussion of BPL/power line communications, long waves (with Kevin Carey), pirates (with George Zeller), National Association of Shortwave Broadcasters (Jeff White), Broadcasters' Forum (led by Kim Elliott), Short Space Antennas (Greg Majewski), and much more, even ham exams led by Skip Arey's VE team. Saturday features silent auction and banquet with prize drawings. Full registration at door \$55, rates available online at http://www.swlfest.com or write for printed form to Winter SWL Festival, P.O. Box 4153, Clifton Park, NY 12065-4153, USA, or email organizers John Figliozzi at jfiglio@swlfest.com or Richard Cuff cufffest@swlfest.com.

March 13: Marietta, GA

Kennehoochee Amateur Radio Club Hamfest at Jim Miller Park in Cobb County on Callaway Road; Talk-in 146.880 (-)PL100; 8a.m.-3p.m., admission \$6. VE exams 9am or no-code training followed by test 8am-5pm (\$40). For more information http://www.w4bti.org and http://qsl.asti.com/hootch/KARC.html or Bob Butler W4RBB, 770-579-9420 or 404-217-1564; w4rbb@arrl.net

March 20: Brampton, ON

Ham-Ex 2004 sponsored by Peel and Mississauga ARCs, at Brampton Fairgrounds (Heart Lake & Old Scool Roads), 9am-5:45pm, adm. \$6, talk-in 146.880(-) 145.430(-). Information visit http:// www.peelarc.org, email ham-ex@sympatico.ca or call Victoria 905-455 4625

March 26-27: Baltimore, MD

Atlanticon 2004 QRP Forum hosted by the NJQRP Club at the Holiday Inn Select just north of Baltimore and next to the state fairgrounds in Timonium, MD, during the weekend of Greater Baltimore Computerfest and Hamboree. \$10 registration to George Heron, 2419 Feather Mae Ct., Forest Hill, MD 21050, or by PayPal to n2apb@amsat.org. All those registered for Atlanticon receive badges and the famous "Atlanticon Kit" before the weekend, as well as the Atlanticon Proceedings (a printed set of the presentations). See http://www.njqrp.org/atlanticon/ for more.

COMMUNICATIONS

message to a cell phone when its owner wanders within range of those merchants. Other applications might include the ability to locate coworkers, customers, or family members.

While some cell phone users find it helpful to let others keep track of their movements or to be notified of nearby stores or services, most would probably rather not expose themselves to round-theclock, everywhere-they-go surveillance. So cell-phone carriers are looking at program options to allow personalized preferences such as when, where and with whom to share location information. Bell Labs said it is testing a "rules-driven" approach which it hopes will be ready for commercial deployment next year.

Magnetic Fluctuation

Scientists say the Earth's magnetic field is collapsing at a relatively rapid rate – 10 percent in the past 150 years. Most scientists think the magnetic field is produced by electric current generated by chaotic eddies in the molten iron of Earth's outer core, and random changes in the eddies cause actual reversals in the magnetic poles. It's happened before, they say – 780,000 years ago was the last flip. Though such a reversal may disrupt migratory animals which use the field to navigate, scientists have noted no species die-offs as a result of

At the current rate of weakening, the field would disappear in 1,500 to 2,000 years. Chances are it would strengthen again with the poles reversed, but no one really knows.

Weather Alert Standard Set

There is a confusing proliferation of radios on the market that carry the National Weather Radio broadcasts and those that claim to provide weather alerts. Early this year the Consumer Electronics Association (CEA) announced the adoption of a new standard for Public Alert receivers. The standard, titled CEA-2009, defines minimum performance criteria for consumer electronics products designed to receive digital alert signals broadcast by the National Oceanic and Atmospheric Administration's (NOAA) Weather Radio service and Environment Canada's Meteorological Services of Canada Radio network.

Specifically, it increases and standardizes the options available to consumers about when and how they are notified of these alerts, such as colored lights, LCD displays, etc. that will indicate a public alert notice has been issued even when the device is in standby. We assume "CEA-2009 compliant" is wording that consumers will want to watch for when buying a new weather radio.

It's a Smart Watch ... Too Smart

Abacus, Fossil, and Suunto watches equipped with MSN Direct data service carry a rarely-read warning. The data service that provides news, weather, sports, stocks, personal messages, appointment reminders, and more is transmitted by FM subcarier. Not a problem, until you wear it on board an airplane. The fine print advises "Airline Travel: The FM radio receiver in your device must be turned off while flying."

Sounds of Silence

Is there a difference between "live silence" and "dead air"? On January 19, the BBC was gambling that there is when it broadcast the first UK performance of John Cage's 1953 composition 4'33" – four minutes and 33 seconds of silence – on January 19th. Engineers at Radio 3 had to shut off the emergency back-up system which would have filled up the "ambient silence" with (real) music.

"Communications" is compiled by editor Rachel Baughn KE4OPD (editor@monitoringtimes.com) from newsclippings supplied by our readers via mail and email. Warm thanks to this month's contributing reporters: Anonymous, NY; Leo Kusuda, VA; Doug Robertson, CA; Brian Rogers, MI; RC Watts, KY; via email: anonymous, Richard Dillman, Maryanne Kehoe, Rick Kissell, Sterling Marcher, John Mayson, Ed Muro, Jerry None, Francis Pacheco, Ira Paul, Doug Smith, Larry Van Horn, Barry Williams, and Robert Wyman.

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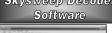
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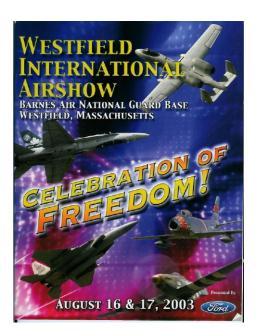
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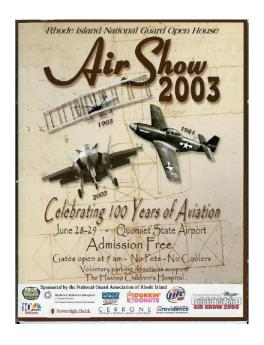
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"On Scene" Monitoring at Air Shows

Story and Photos by Ken Windyka (ken.windyka@the-spa.com)



ir shows provide excitement and variety for young and old alike. An air show may range from a small show with limited aerial performers and static aircraft displays to a large military base air show or open house with many military and civilian aerial performers plus large static displays of military and civilian aircraft. Additionally, World War II "war bird" static displays will be at many larger air shows. (See the companion story on the Dayton Air Show for an example of one of the largest.)

Approximately eighty U.S. shows each year feature major precision high performance military demonstration team aircraft such as the US Air Force "Thunderbirds," US Navy "Blue Angels," and Canadian Armed Forces "Snowbirds." Many shows also have other military aircraft/helicopter aero demonstrations and flybys depending upon the availability of aircraft, as well as precision parachute teams such as the US Army "Golden Knights" or US Navy "Leap Frogs."

Most larger air shows will also have civilian aerobatic performers such as Gene Soucy's *Showcat*, Sean Tucker's *Oracle Challenger II*, Mike Goulian Airshows CAP-232, Wing Walker Teresa Stokes, Mike Mancuso's Extra 300L, Bob Cipolli's S-300, The Flying Farmer's L3 Piper Cub, Chuck Lischer's F-260 Warrior, Dan Buchanan's Pyro Hang Glider, Starfighter CF-104, Allen Smith's L39 Albatross Soviet Jet Fighter, and the Heritage Flight (a combination of current military technology and past such as the P51 Mustang and the F-86 Sabre Jet), and many other performers that are members of the International Council of Air Shows.

Additionally, there can be a variety of ground demonstrations such as the "Super Shock Wave Jet Truck" or the "Flash Fire Jet Funny Truck" racing down the runway at 300 mph; "Mad Bomber" Pyrotechnics Demonstration in conjunction with A10 Thunderbolt simulated ground support mission; bomb squad remote control robot, police dogs search

and apprehension; helicopter rescue operations; model aircraft, ultra light aircraft, etc.

"At the Show" Scanning

The scanner hobbyist has a very distinct advantage over the general public at air shows. Not only can the hobbyist see the action, but he can hear the radio transmissions directly related to the aerial performance, as well as the various support radio communications for the entire air show.

At the larger shows, some hobbyists arrive one to three days before the show starts to participate in watching and monitoring radio communications for "preshow" aircraft arrival as well as the practice sessions of many military and civilian aerial performers. This preshow arrival activity allows time for "show and tell," when hobbyists meet and discuss equipment issues, find show frequencies, and put faces to names from various hobby internet mailing lists. Preshow activities may also provide unique photographic opportunities.

The "on scene" military communications/aero monitoring hobbyists utilize a variety of radio monitoring equipment, ranging from small portables to mobile scanners operated from vehicles parked nearby. By far the most interesting scanner equipment setups at some of the Eastern United States "show lines" are the "wagon guys," who bring many radios, antennas, speakers, and a power supply transported in wagons.





Getting Prepared

In order to get the most out of scanning at air shows, it's important to obtain as much information as possible before arrival at the show.

Obtain Air Show Information:

Most air shows will have an internet website active about one month prior to the show. If you know the name of the show or aero performers, you can perform an internet search using such search engines as "Google" (http://www.google.com). One of the best websites for finding an air show scheduled (small to large) close to where you live or want to visit, is the International Air Shows Inc website (http://www.airshows.org/schedules.htm). This site will provide extensive information on all air show performers as well as links to other websites relating directly to the show and performers at the show.

Obtain Potential Frequency Usage Information

Table 2 provides sources for frequency information. I'd classify the range of communications monitoring into the following:

ENROUTE TO THE SHOW – Depending upon how far you are traveling to get to the show this could be an extensive list of state, county, and local police, highway pa-



trol, fire and EMS, as well as specific toll road authorities. If radio systems are linked by repeaters, you may be able to monitor activity 20 to 30 miles away and have a good understanding of the traffic situation in the show area. Note: it's very important to understand and comply with the laws of the various states you are traveling though and/ or where the air show is located, since some may prohibit the use of a scanner in a motorized vehicle.

AERO COMS AT THE SHOW - By far these are the most important aspect of your scanning/radio communications efforts, and can be placed into these major categories: Air Traffic Control, Show Control, and Aero Per-

Monitoring ground control, tower, UNICOM (non tower operations), the air route traffic control center (ARTCC), and other low level approach controls will give you an excellent "heads up" to any flybys or inbound aircraft. The Show Boss frequency may be a discrete frequency (see table 1), as well as other various civilian aero performers tie-ins with their ground crews and the shows public address system.

However, there's a very good chance that



the normal tower or ground VHF and secondary UHF frequencies will also be show control and utilized by many of the performers. Refer to Larry Van Horn's Milcom column in this issue for the potential frequencies for major military performers. Additionally, the local military aero command post frequencies might also be used for air/air or air/ground communications.

AIR SHOW GROUND SUPPORT -There's a wide variety of frequencies that could be utilized, both military and civilian, depending upon the venue of the performance - for example, active military bases, guard/



Blue Angels Comm Cart - see p.64

reserve bases, joint military/civilian airports, or civilian airports.

At military bases, the usual security, fire/ crash, medical, and base operations radio nets will be used for those functions. Other radio nets, such as civil engineering, aircraft maintenance, fuel, communications, and command nets, may be utilized for a variety of air show support as well as the nets' normal functions.

Table 1 – Show Boss. Civilian Performers. and **Air Support Discrete Frequencies:**

Unicom at airports with no control

122.700

122.725

122.750

122.775

122.800

122.825

122.850

122.875

122.900 122.925

122.950

122.975

123.000

123.025

123.050

123.075

123.100

123.125

123.150

123.175

123.200 123.225

123.250

123.275

123.300

123.325

123.350

123.375

123.400

123.425

123.450

123.475

123.500

123.525

123.550

123.575

Unicom at airports with no control tower Private fixed wing aircraft air-to-air
Unicom at airports with no control tower Domestic VHF
Domestic VHF
Unicom at airports with no control tower Unicom at airports with no control tower Unicom at airports with no control tower Helicopter air-to-air communications Unicom at airports with no control tower Unicom at airports with no control tower
Itinerant Itinerant Itinerant
Itinerant

Hot Air Balloon Ground Crews/Chase Recovery Teams:

151.625, 151.70, 151.805, 151.895, and 151.955

However, last year at one active duty military Air Force base (Hanscom AFB, MA), most of the show support radios had been reprogrammed into new frequencies in the 148 to 150 MHz range, even though the base didn't normally operate very many radio systems in that frequency band. So, if you are on a military base and you are not finding any activity on known frequencies, it's time to place the scanner into the "search mode." Also, local, county, and state law enforcement may be assisting in certain aspects of on site security and vehicle traffic control.

At joint use military/civilian bases and civilian airports, there's most likely going to be an airport authority radio system. Furthermore, it's very likely that local, county, and state law enforcement agencies will be providing support and using the local and state police department's frequencies as well as a common local area coordination frequency.

In some instances, communities might have a special radio cache available for such large events that can utilize the 800 MHz nationwide ITAC frequencies (see table 3) for simplex and/or conventional repeater utilization. The local/county fire department may also be providing support (see table 3 for potential mutual aid frequencies).

There may also be a local public or private ambulance/paramedic service available to provide transportation to emergency medical facilities if the need arises. Typical VHF and UHF medical assignments (See table 3 for examples) will be used for ambulance to hospital communications and also the ambulance company might have a business band frequency that might be utilized.

PERSONAL COMMUNICATIONS -Many commercial vendors at the air show will likely be using a variety of Family Radio Service (FRS), Multiuse Radio Service (MURS), and business band low power frequencies to coordinate their activities; so, again, placing your scanner in the search mode may uncover these active frequencies.

Some hobbyists may also utilize FRS, MURS. General Mobile Radio Service (GMRS), or Amateur Radio frequencies to coordinate meeting in the parking lot or on the show line. I know one hobbyist who uses a combination GMRS/FRS radio/GPS receiver so that he can find his car in the parking lot! A common usage by hobbyists in past events has been FRS Channel 14 (467.7125 MHz), PL code 38 (250.3 Hz) with alternate FRS/ GMRS Channel 7 (462.7125 MHz), PL code 15(110.9 Hz).

Other Considerations **Security**

Security policies will affect what you can bring into the air show area. Items that are typically banned include any weapons (e.g. guns, knives, mace, razor blades), coolers, large carry bags, glassware, drinks with ice, skate boards, roller skates, and pets. Usually there will be a sign posted at the entrance (and/or transportation pickup point) indicating what is prohibited. Also the show



Bomb Squad Robot Demo

website will normally have a security Frequently Asked Questions (FAQ) webpage.

At the show entry security control point, expect all your carry items to be thoroughly searched and perhaps you will receive an "electronic" or physical pat down. However, if you arrive early enough and get "on site" parking at air shows that have that option available, you can always return to your vehicle for refreshments and other food as necessary that were left in the cooler and also utilize your mobile scanner to monitor the action while relaxing in your vehicle. As you leave the security check point there will be

an opportunity to buy a show program guide as a memento of your attendance at the show.

Static Displays

Aircraft and other static displays can offer a wealth of information to the scanner hobbyist. Ideally a camera, especially a digital type (even at lower resolution of 640x480 dots per inch), will allow very easy documentation of such items as aircraft tail numbers, aircraft art work, radio communications cards (rare), aircraft interiors (including radio equipment) and other exhibits. There may also be information handouts that you can take



Comm Card for USCG helo

with you, and some units sell patches and other novelty items.

Furthermore, if static display aircraft have crew members in attendance, here's your chance to ask such questions as:

How long have you flying in this type of aircraft?

What was your most memorable experience flying this aircraft?

What radio callsign did you use when you flew in?

Will you use the same callsign when you fly out?

Do your radio callsigns vary for local training versus cross country flying? When training, what tactical air/air frequencies do you normally use?

Table 2: Air Show Frequency Information Sources

Local, County, State Radio Systems:

Police Call (9 printed volumes for various geographic locations), which also includes (nationwide) CD-ROM (Hollis Radio Data and Pozilla Software). Available at Grove Enterprises and various Radio Shack stores.

Military Frequencies and Selected Civilian Air Traffic Control Frequencies:

Military Frequency Directory, 2001 edition, (Grove Enterprises, www.grove-ent.com, 800-438-8155)

Federal Frequencies:

Federal Frequency Directory, 2001 edition, (Grove Enterprises).

Military and Federal Frequencies:

The 'Top Secret' Registry of U.S. Government Radio Frequencies 8th edition" (Tom Kneitel, CRB Research Books, Inc)

Civilian ATC Frequencies and selected civilian airport diagrams:

US Government FLIP Airport/Facility Directory (7 volumes (Northeast, Southeast, East Central, North Central, South Central, Northwest, Southwest), National Aeronautical Charting Office http://www.aco.faa.gov.

Hobby Internet Mail List Servers and Other Websites: http://www.qth.net	MILCOM and FEDCOM, as well as some geographic area general scanning lists.
http://www.yahoogroups.com	
http://monitoringtimes.com	
http://164.214.2.62/products/digitalaero/index.cfm	Military Flight Information Publications.
http://www1.faa.gov/NTAP/index.htm	
http://www.airnav.com/ http://svartifoss2.fcc.gov/reports/index.cfm http://www.airshows.org/schedules.htm	Information on civilian airports FCC site search
http://www2.acc.af.mil/airdemo/links.html	civilian air performers
http://www.airshows.pa.hq.af.mil/eligible_events.html	
https://www.seal.navy.mil/leapfrogs/default.asp	USN Leap Frogs USAF Thunderbirds USN Blue Angels



Staking out an area on the show line

What communications range do you normally achieve with Low Band FM, vs VHF aero, vs UHF aero ? (e.g. Army National Guard Helos)?

Do you use High Frequency Single Side Band to talk directly with your wing command post?

Where do you most of your local flying training?

At times, the crew members may politely tell you that they can't answer a particular question, but no one will be offended.

Spectator Seating

The spectator show line is another very exciting aspect of the air show. This is the area parallel to the active runway/aerial show box area, and which allows easy observation of all aerial and most ground performances. With prior coordination (e.g. via FRS radio or internet mail list servers) with other hobbyists, it may be possible for you and/or your group to "stake out" your own area to beat the afternoon spectator crunch for the major performers. Here again, being with a group of like-minded hobbyists can greatly aid in your enjoyment, because with many folks monitoring the frequencies it's possible to discover new frequencies in use; it also allows you to take fairly close pictures of the air show performers while others monitor the frequencies.

Conclusion And Safety Reminder

Attending air shows "on scene" can be very exciting and informative. However, it's also important to address safety and health issues by wearing appropriate clothing to match weather conditions; liberally applying a high protection factor sun screen lotion to prevent sun burn, (even on cloudy days); drinking plenty of water; getting out of the sun for awhile (either returning back to your vehicle or finding a hangar or aircraft wing for some shade); and limiting



alcohol consumption.

Also follow the golden rule "treat others as you would like to be treated." Share your hobby "on the show line" with non-scannerists by letting them listen to the aero performers' communications. Finally, plan on arriving early and leaving late. Although public safety officials will do their very best to ensure effective traffic control, with tens of thousands of people and cars all trying to leave at the same time you can expect a fairly long wait. Some hobbyists may have a "tail gate" party in the parking lot after the show ends, and then 2 to 3 hours later drive out without any traffic. I've personally experienced waiting anywhere from only 15 minutes to approximately 2-1/ 2 hours before getting out of the show parking areas.

Hope to see many of you in the upcoming year at some of the Northeast US air shows!

Table 3: Common Public Safety Support Frequencies

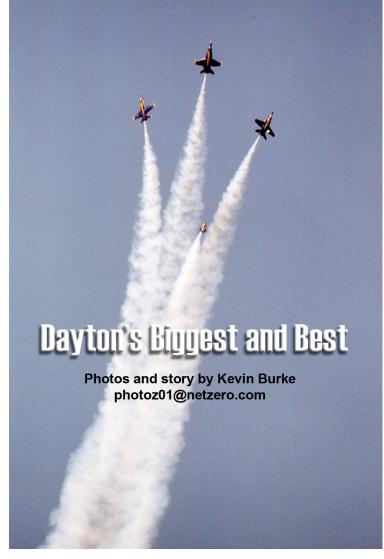
Fire Departments:

45.88, 154.265, 154.28, 154.295 Law Enforcement:

155.475, 866.0125, 866.5125, 867.0125, 867.5125, 868.0125

155.16, 155.28, 155.34, 462.95, 462.975, 463/468.0000, 463/ 468.025, 463/468.05, 463/468.075, 463/468.100, 463/468.125, 463/ 468.150, 463/468





he 2003 Dayton International Airshow in mid-July was expected to be the best-ever show at Dayton. With the weather cooperating and all but a couple of the expected aircraft in attendance, it would have been impossible to have anything but the biggest and best.

By Saturday, the third day of aerial events, the announcers were starting to call it the Dayton MOA. To the pilots in the crowd, this meant "Military Operations Area," but for everyone else the acronymn meant "Mother Of (all) Airshows."

They really did have everything there, from a replica of the Wright B Flyer to a flyby of a B-2 bomber. Also on static display were many unmanned reconnaissance and bomber aircraft.

All three jet teams were very good, although the Canadian Snowbirds seemed to draw more applause from the crowd, who seemed more impressed by the maneuvers and formations of the quiet CT-114 rather than the noise and raw power of the F-16s and F-18s flown by the Thunderbirds and Blue Angels.

I was very impressed by the Navy's F/A 18 Super Hornet. It's not easy to tell the difference between a regular Hornet and a Super Hornet, but once in the air it squeezes vapor off its wings on almost every turn, and those turns are so sharp you'd think it has thrust vectoring engines. I got the impression this jet is capable of much more than the Navy wants to show us yet – like perhaps a hammerhead stall, or a square loop tighter than Sean D. Tucker. (Which I think he can pull off inside of a one car garage.)

The Navy also showed off its P-3 and S-3, and the Harrier jet. It is interesting to see and learn about these aircraft. I think the Navy would have owned the show if they had also had the F-14 Demo Team flying. The F-15 Demo looked best when flanked by three P-51 Mustangs, and Sunday a P-38 was added to that formation.

The B-2 flew by only on Saturday. There was an F-117 flying each day. I personally complained to one of the Stealth pilots after Thursday's performance, "Three lousy slow flat passes!" The pilot explained that some Air Force Demo pilot had

bent the rules lately and all demo pilots were told to keep it tight and by the book. I begged for at least a wiggling of the wings during those flat passes. Each day after that the F-117 demo got better.

On Saturday a U-2 did a flyby, and after climbing through the short-lived overcast, he called back to the announcer and calmly said, "I've got a problem, I've lost the engine."

A very well coordinated response followed. Fire trucks rolled to both ends of the runway, and the airboss put everything on hold. The U-2 had someone there with the announcer, with a book of procedures for the U-2. When the pilot said he thought it was a compressor stall the person on the ground was ready to read off a checklist for compressor stall problems.

The pilot was asked if he wanted to land at



Dayton or go to nearby Wright-Patterson AFB; he chose Wright Patterson. The person on the ground for the U-2 told the pilot he needed time to drive to that airport to guide him down to landing with a chase car. That was the last I heard of the U-2.

I listened mostly to the jet teams on the radio. The Thunderbirds make it easy by using two radios, one UHF and one VHF. I set up two scanners connected with an adapter that takes the feeds from both scanners and feeds the audio into stereo headphones by making one feed the left channel and one the right. So one scanner scans known Thunderbird VHF frequencies, and the other scans the UHF Thunderbird frequencies. (See page 64 for frequencies for all the military flight demonstration teams.)

I have heard that by setting up two scanners like this you can damage them but I haven't had

any problems. An interesting note on this set-up is that many times I have heard both UHF and VHF frequencies used in the Thunderbirds' normal way of communicating. "Boss," the number 1 jet, will say something on the VHF frequency and the solos will answer on UHF.

The Snowbirds are easy to monitor. For shows it's pretty much $272.1\,$ MHz.

The Blue Angels have to make it difficult, though. They use one frequency for start-up, and as they taxi down the runway they change the frequency; the solos have a frequency and the diamond has a frequency, but there's more to it. There is also what can be described as an "on stage" or "show line" frequency, that is, in front of the crowd. Whoever is performing the maneuver on stage uses the on stage frequency, and when they exit the stage, they go back to their other frequency, whether it's the diamond or the solos.

For one of their opposing passes one of the solos said, "Do you think Orville and Wilber envisioned this?"

Each day I was at the entrance gate by 7:30 am and had no trouble with traffic, but I heard reports that traffic was really bad later in the day. Though the planners of this show did everything they could to minimize traffic delays, the people just kept coming.

With four days of airshow flying I found it difficult to see all of the static displays. In between the military acts were great civilian performers like Patty Wagstaff, Julie Clark, and Sean Tucker, among others. Also flying was a Ford Trimotor and a replica of the Spirit of St Louis, as well as a mock air race with Mustangs, Corsairs, and others.

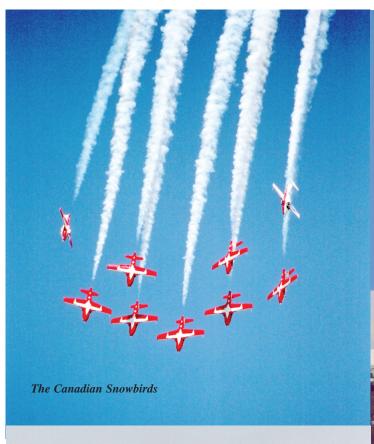
The 2003 Dayton International Airshow was by far the biggest and best airshow I have ever been to. You can check it out for yourself July 17-18, 2004!



















 $The \ Wright \ Brother's \ Flyer$







Radio France International

By Luc Gougeon

to the shortwave transmission almost all day long.

One morning, one of the

One morning, one of the passengers on the cruise asked me "how the fishing was?" in reference to my radio. I handed him the radio so that he could put his ear up to the tiny speaker to hear the news. From that point on, I became the official news source for all of the 140 passengers aboard. Slowly cruis-

ing down the Volga River, everyone on the boat seemed to want to know how the Tour de France was progressing and any other news items that I could offer.

Most of the French passengers on the boat had no idea that RFI even existed. Radio listeners can pick up RFI either in Paris on 89.0 FM or anywhere outside of France. If you live in France but outside of Paris, your only option is to listen through the internet. Having lived in Paris for over three years, I almost always tune into RFI to hear the news because they offer a wide variety of international news provided by their correspondents throughout the world.

The Radio France Group was created in 1929 in order to control radio and television; the government at the time was the main broadcaster. The government of France is an active contribu-

tor to the provision of quality programming on public radio and television. Although primarily a public corporation with 86% of its funding received from the government, Radio France (unlike, for example, the United States' NPR), is permitted to run advertisements.

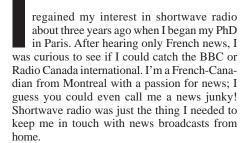
Radio France is a conglomerate of not only "Radio France International" but seven other radio stations as well. In 1963, the headquarters of Radio France was built in Paris in order to assemble all of the radio production facilities into one building. This modernistic building, which is located in the 16th arrondissement of Paris on the bank of the river Seine, is home to these seven major radio stations, sixty-one production studios and a concert hall for the Radio France symphonic orchestra.

It is possible to visit the radio museum of Radio France on weekdays between 10 and 11 a.m. or between 2:30 and 4:30 p.m.

The building is the headquarters of Radio France International and RMC-MO (Radio Monte Carlo Moyen Orient), a radio station oriented exclusively towards the Middle East. The seven other stations of Radio France are France Inter (news and music), France Info (24 hour news), France Culture (Cultural news, theater, etc.), France Musique (mostly classical music), France Bleu (national and regional radio system), Le Mou'v (station for young people) and FIP (music). All of these stations can be accessed on the internet on the Radio France web site http://www.radiofrance.fr

Background on RFI

Let's go back to Radio France International, the station that is most definitely aimed towards an international audience. RFI was created by the Ministry of Foreign Affairs to send radio broadcasts towards Africa and the Middle East. France, like many European countries, used to have colonies all over Africa and was a major presence in Algeria, Tunisia, Morocco and Lebanon. French is still a popular language throughout a vast part of the African continent. Before RFI became a completely independent entity from Radio France in 1986, the station was of-



Shortwave Fills a Vacuum

Most people don't really understand our passion for radios, antenna building, etc. Last summer, I took a cruise on the river Volga in Russia. During this cruise, I experienced the pleasure of introducing the miracles of shortwave radio to my fellow passengers. For most people, this eleven day cruise from St.-Petersburg to Moscow was not only a vacation from their normal lives but also a vacation from the unlimited sources of national and world news that we tend to take for granted. For me, however, it was a real pleasure to get out on the deck with my radio and enjoy the sun. I brought the very small and economic Grundig Mini World 100 PE radio which provided me with excellent reception. I normally use a Yaesu VR-500 radio, but I didn't want to risk losing it or having it stolen.

The VOA and the BBC came in very strong pretty much all day, but at the time I was mostly interested in listening to RFI (Radio France International). The Tour de France had just started and I wanted to follow Lance Armstrong's progress for what would become his legendary fifth win. While in St-Petersburg or Moscow, I was able to listen to the RFI radio relay on 1440 AM. Outside of those two cities, I could listen





ten referred to as the "colonial station."

France continues to be present in the Ivory Coast despite the civil unrest that is currently going on, so the importance of maintaining open communica-

tion with Africa is essential for the French government. The French and greater international radio community was recently reminded of the danger of working in Africa when the RFI radio journalist, Jean Hélène, was brutally murdered by police on October 21, 2003, while on a mission in the Ivory Coast. You can follow the actions of the "Reporters sans Frontières" (journalists without borders) against the Ivory Coast government on their website http://www.rsf.org. This French organization follows the liberty of press issues around the world. The web site is available in English.

RFI boasts an average of 45 million daily listeners and the RMC-MO, her sister station directed towards the Middle East, attracts about 15 million. On a weekly basis, RFI produces 112 hours of French programming and 340 hours of foreign language programming in 19 different languages. The English section of RFI produces 38 hours of weekly programs.

A Visit to Radio France

I was fortunate enough to visit the office of Radio France Internationale and see for myself how this monster of a radio station works. The main office of Radio France International is located in the Maison de la Radio building in Paris. The Paris office gathers all of the information from its worldwide correspondents and offices. RFI also manages radio stations in Lisbon in Portugal, Sophia in Bulgaria, and Bucharest in Romania: all of these offices are directly connected to the Paris office and can easily transmit programs from Paris to all of these countries.

The ambiance of the Radio France office is quite casual and I immediately felt right at home. I visited the office on a Monday morning and I was rushed from the press department to a big conference room where once a week, the directors of each section of RFI meet to prepare the weekly schedule. About 17 people sat around this table and stated the weekly mission of their particular section; Africa, America, Asia, Eastern Europe, science and education, sports, poli-

tics, health, etc. During this meeting, they prepare the list of people that need to be contacted, journalists that need to be sent out on missions, and finally reportage to be written and produced.

I was told that daily meetings also take place at 9:30 a.m. and 3:45 p.m. to make sure that the radio programming is consistent with any breaking news. These meetings are naturally smaller and shorter in length as compared to the weekly meeting which normally lasts for over an hour.

After this very interesting meeting, many members of the staff told me that they were happy that an American maga-

zine would be publishing an article about their radio station. The general consensus was that Radio France International could broadcast even more towards the United States if provided an audience.

I was taken by the press managers to where the real action takes place: the press room. The press room is where the television screens are broadcasting news from foreign stations and journalists are preparing the news that they are about to read in the various studios that spread out along a long corridor. Every section of Radio France International also has a smaller working space such as the Latin American room or the Russian room.

The studios of Radio France International are slowly moving towards digital technology. A sound engineer told me that the good old fashioned analog tape was still "king of the office" regardless of more modern options. Wherever you walk, you can see people hunched over analog equipment. The African studio is said to be the only digital workhorse so far.

It's in one of those studios that I was invited to sit during the only show oriented toward a North American audience. Since 2002, Radio France broadcasts a thirty minute American Journal, in French, between 1100 and 1130 UTC. I sat with Jaqueline Paré, the anchor of this show, who is married to a Canadian and has studied communication in Montreal. She explained to me the mission of Radio France International for the United States.

The show is considered a prestige operation for the Radio France International. The audience, I was told, is partly French government workers in the United States, United Nations staff in New York, French speaking diplomatic communities, Haitian, African and French expa-

triates and hopefully any Americans who may speak French. The show does not have an American content since American news is obviously more than sufficiently available throughout the United States. The show strives to not only review European and African news stories, but to also offer a different point of view to the American audience.

Broadcasts and Schedules

The American broadcast is transmitted on shortwave, according to the latest schedule, on 15515 and 17610 kHz between 1100 and 1130



UTC. It's also possible to listen to RFI in New York on 91.5 FM WNYE, in Boston on 740 AM WJIB and in Washington DC on 1120 AM WUST. RFI is also available on the Dish Network channel 660 or in Canada on the Videotron or Bell Express Vu on channel 979. The complete list of frequencies can be found on the website or through the Relations with Audience Office (service des relation avec les auditeurs) which can be contacted at courrier.auditeurs@rfi.fr.

RFI also broadcasts towards the Caribbean from its transmitter located in the city of Montsinéry in French Guyana on 15515 and 17860 between 1230 and 1330 UTC, 9800 and 11665 between 0130 and 0200 UTC. Folks in the Southern part of the United States should try to listen to this relay.

RFI shortwave broadcasting is mostly targeted towards audiences in the African continent. The colonial past of RFI still has a direct affect on the mission of the radio as a whole. RFI has staff all over Africa who work with a network of 65 FM relays in major African cities. The news from Paris is added to local programming.

The transmission of Radio France International has also been vastly extended towards the Middle East through her sister station RMC Moyen-Orient. RMC was specifically created



to cater to the Arabic language population of Northern Africa and the Middle East. More information about RMC can be found at **http://www.rmc-mo.com**. An FM radio relay was recently powered in Baghdad on 93.5 FM. RMC can also be heard in Jordania, Qatar, Bahrein and Lebanon. For the soldiers serving in Iraq, the RFI English language broadcast can be heard on 17620 between 1400 and 1500 UTC or 11615 between 1600 and 1730 UTC.

Future Possibilities

It is obvious that Radio France International is a major player with the BBC or VOA to a worldwide audience. Readers need to remember that RFI is largely financed by the French ministry of Foreign Affairs, RFI is the voice of France abroad. For the American listener, it's the perfect occasion to practice the French he or she may have learned in high school or college and also learn a fair amount about contemporary France and Africa.

RFI is exploring all the new methods of transmitting its programming: WorldSpace, DRM or DAB. Information about RFI programming by those means of transmission can be found on http://www.worldspace.com or http://www.drm.org.

The latest corridor hype at the headquarters of RFI is the creation of an International French News Network that could compete with CNN or the BBC World. RFI envisions itself as a future provider of news alongside the French press agency, AFP, and the France Television group for this new international broadcaster. TV5 which already broadcasts French television content worldwide could also participate. The 360 journalists of RFI could soon be helping to create a new TV channel and possibly make this radio group into an even more powerful French news provider to the world.

I hope that readers in the United States and throughout the world can enjoy and benefit from the services provided by Radio France International. I believe that this is one group to watch in upcoming years for new and interesting radio programming.









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Is it Broadcasting or Datacasting?

By D. Prabakaran

s broadcasting adopts digital delivery, one can see how quickly it evolves into something new. *Digital convergence* has blurred the borderlines between the conventional broadcasting industry and the communications industry. Content and service providers can deliver their services through multiple delivery channels: Consumers can access services via a variety of means. The future of media distribution is expanding in all directions.

A concrete example of this development is datacasting, i.e. the delivery of multimedia content and services via digital broadcasting networks. Industry has developed technologies that will finally make digital convergence a reality. Raw data consisting of multimedia-media, programs, newspapers, magazines, news, entertainment, art, graphics, alert and real time control systems are multiplexed together as part of an Internet or MPEG payload. Forthcoming digital enhancements could supercharge radio datacasting, providing feeds of up to 300kbps

The DAB Revolution

Digital Audio Broadcasting is set to replace current analog radio using a revolutionary technology that allows CD-quality sound to be transmitted digitally along with text and other data, using terrestrial transmitters. Digital Audio Broadcasting is a "push" technology ideally suited for the 21st century. It was originally developed as part of a collaborative research program known as the Eureka - 147 Project with the intent to supersede conventional analog AM and FM services, which suffer from interference due to high congestion and multipath propagation. When fully deployed, DAB will deliver highquality audio similar to that of CDs to mobile and portable receivers, which typically experience greater reception difficulties than stationary receivers. And listeners will not have to change frequency as they travel.

But there is more to DAB than just audio: according to the Multimedia Object Transfer (MOT) specification, DAB can also carry text and graphics, including internet pages.

What kind of data can be transmitted? It can be material associated with a television program like *Nova* – biographies, statistics, websites, interview transcripts, still images – that enhances the content of that program. Or it can be material that has no connection with any program, material that you might otherwise get off a CD or download from the internet – educational materials, public agency documents, weather reports, software programs, or video clips of public meetings. The data that comes in today's analog signal isn't very flexible – one can't do much with it except view it on the screen at the

moment it's broadcast. Digital data, on the other hand, is highly flexible.

The data capacity in datacasting using present techniques on TV and FM ends at about 19 kbps; this, however, is where the capacity of DAB starts. This makes DAB a medium well suited for transporting data for data services. Data services for broadcasters of course can be song-, artist- and program information. Radio games and hit parades will get a new dimension using program-associated data to display questions or artists nominated for the hit parade. Traffic messages can be transmitted in speech, utilizing a 32 kbps subchannel, together with regional labels for the listener to recognize. The traffic messages can be stored into a memory for later play-back.

Other applications can be: file-transfer, software updates, real-time distribution of financial information, facsimile applications, database updates for public and semi-public spaces or even interactive multi-media applications with or without a return channel.

Also, DAB is perfectly suited for delivering high volume multimedia content, providing simultaneous reception at all locations and fixed distribution costs, irrespective of the number of receivers. Traditional providers can add a variety of textual or graphic data to their music programming – including advertising and lyrics for "karaoke" applications. But media migration will mean that newspapers and faxes can also be delivered by DAB. Traffic, weather and financial information can also be supplied in this way – either as text or as speech generated from text.

As providers explore the enormous potential of this new media, we will see DAB used for file transfer and software or database updates. Internet providers will display HTML encoded information, and interactive applications will also appear, using a back-channel for feedback, quiz games, etc. Selected information can be stored in the DAB receiver for later retrieval

Two types of DAB systems are currently nuse.

 EUREKA147 DAB - UK, Canada, Germany, Netherlands, Norway, Sweden, Russia, etc
 IBOC DAB - USA only

The most advanced system, both with regard to deployment and to the features offered, is probably the European Eureka-147 digital audio broadcasting (DAB) system that is in operation commercially all over Europe as well as in the Far East (Singapore, Taiwan), Australia, and Canada. In the US there is the terrestrial in-band-on-channel DAB (IBOC DAB) system, promoted by iBiquity, and the satellite digital audio radio system (SDARS) by XM Radio and Sirius Radio. All these systems have in common that they broadcast digitally, and some of them —

Eureka-147 DAB and IBOC DAB – explicitly offer data channels.

Eureka-147

The European Eureka-147 DAB utilizes two datacasting vehicles: Program-associated data (PAD) and data channels. The PAD feature allows us to piggyback data onto a broadcast audio stream. Applications for this include sending the cover image of the currently running soundtrack but also allows for scrolling text. The data channel provides a high-bandwidth (up to 384 kb/s per channel) delivery mechanism to the receivers.

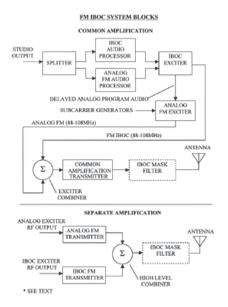
The OSI model for Eureka-147 DAB specifies seven layers, from the physical layer (actual radio transmission of the *OFDM* signal) to the presentation layer (final conversion and presentation of the broadcast information to the listener/viewer). An intermediate transport layer identifies the audio and ancillary data services and multiplexes them. There are two areas where such ancillary data may be carried within the system multiplexer:

1. Fast information channel (FIC): this carries information about the multiplexer, TMC, paging, conditional access (encryption), PTY, etc.
2. Main Service Channel (MSC): This can be used for general data services, including program associated data (PAD) – information directly linked to the audio program, such as song and artist identification, lyrics, and dynamic range control (DRC) data.

Eureka 147 DAB is a very flexible format. In particular, the framers of the specification were careful to include the ability to transmit data, either alongside and related to the digital audio, or as separate data broadcasting services. At the IBC2002 conference, Harris broadcast company demonstrated the results of a significant technological co-operative effort, with the broadcast of MPEG-4 video over DAB.

To broadcast realtime video on DAB, the best solution within the DAB specification is to use internet protocol datagram tunneling. To achieve this, Harris has developed an IP tunneling module, compliant with the ETSI TS 101 735 standard. MPEG-4 is rapidly becoming the preferred format for live streaming. The IBC demonstration used Envivio Live Broadcaster (ELB) to perform the MPEG-4 encoding from a live audio and video source or from pre-recorded material.

The ELB operates in real time and provides high quality MPEG-4 files for streaming by any compliant server. The result is a powerful demonstration of the capabilities of MPEG-4 video over DAB. It features broadcast-quality source material and encoding, and the receiver is



a handheld device, but the fundamental architecture allows any MPEG-4 encoder and decoder to be used.

Applications range from true video broadcasting over DAB – perhaps movies for children through special purpose video transmission; perhaps around special events and functions, through to new video applications. City taxi drivers, for example, could see for themselves the traffic flow through key interchanges before selecting a route.

DAB digital radio PCI card and software

A computer card capable of receiving the L-Band DAB signal could provide a fast route onto the information highway for digital radio. Similar to FM cards now available to receive music, the DAB card would create a new revenue stream for data delivery to the households that already have personal computers or personal digital assistants. There is now a wide range of slot-in cards for PCs that allow users to listen and receive DAB and Digital Terrestrial Television (DTT) radio stations.

The DAB digital radio card fits into a PCI slot in a PC's mother board; the supplied driver works withWindows-98, Me, 2000 and XP. The user interface provides full program information on screen, displays text associated with programs, allows recording at the click of a mouse, and gives users the ability to schedule recordings ahead of time from program lists. Recordings can be stored as MPEG-2 files, or in MP3 format for high quality sound downloads to MP3 players.

Features of DAB Digital Radio PCI Card

·Look at the schedule for every station for the week ahead and

select any programs to be recorded.

·E-mail a program presenter at the click of a mouse.

click of a mouse.
Download recorded programs to most portable MP3 players for "listening on the move."



DAB Digital Radio PCI Card

·Easily link to the web site of the station you're listening to.

·Show all radio stations broadcasting a particular genre e.g. Sport, News etc.

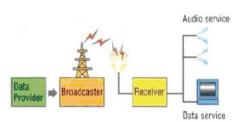
Play back high quality recordings made on the PC.

 Gain access to at least 18 radio stations, many of them exclusive to Digital. Set your PC's clock from the accurate signal broadcast as part of the DAB transmission.

IBOC (In-Band On-Channel)

IBOC (In-Band On-Channel) digital radio technology, also referred to internationally as DigitalSystem C, facilitates the introduction of Digital Sound Broadcasting (DSB) by allowing existing FM stations to broadcast the same programming in analog and digital without the need for new spectrum allocations for the digital signal. The IBOC technology developed by iBiquity Digital Corporation focuses on a transition to digital that works within existing broadcasting infrastructure. The IBOC digital signal is placed within the existing analog FM spectral emissions mask, and as a result IBOC is proposed as the digital solution which may be implemented without the need for new frequency allocations or without disruption to the existing broadcasting infrastructure.

IBOC DAB system has been designed to support the broadcast of data services in all modes of operation: FM hybrid and all-digital, and AM hybrid and all-digital. In the hybrid mode, broadcasters will continue to transmit an analog signal while adding the IBOC signal in the sidebands. Each mode will have different data throughput rates, but in each case a significant amount of data can be delivered, representing a substantial upgrade to the existing subcarrier services. The digital signal is modulated onto a large number of subcarriers, using orthogonal frequency division multiplexing (OFDM), and they are transmitted simultaneously.



Courtesy Radio World Newspaper Online

Due to the nature of the FM band, FM broadcasters will have the greatest potential to leverage datacasting opportunities. The FM hybrid mode can deliver up to 150kb/s of throughput. Current design has the maximum audio rate set at 96kb/s, which would result in 54kb/s being available for data services. This rate, while only a one-way transmission, far exceeds the throughput of other widely available wireless transmission systems at a fraction of the cost. In the all-digital mode, the capacity of the broadcast throughput roughly doubles to approximately 300kb/s, ample capacity to support five-channel surround sound and sophisticated data file transfers.

As IBOC receivers advance and manufacturers take advantage of enhanced displays, stor-

age capacity and in-vehicle applications, the utility of an IBOC data broadcast significantly increases. Broadcasters will be able to brand programming for display on rear-seat entertainment units, stream 800 numbers and URLs of advertisers for easy retrieval from a receiver, deliver valuable information inexpensively to a telematics provider's customers and update integrated navigation systems with real-time traffic conditions and location-based advertising. Couple these receivers with a return channel and listeners would be able to complete transactions for concert tickets, CDs or additional advertising information.

Thanks to the ongoing transition of analog to digital, it is now possible to combine video, audio and data within the same signal. This combination leads to powerful new applications that hold considerable commercial potential. Ongoing and future research will explore Datacasting with a backchannel: Quite a number of interesting and exciting applications become possible with even a small bandwidth backchannel such as the SMS (short message service) feature of the GSM networks.



IBOC prototype radio and display, courtesy "Water Cooled Newsletter" SBE Chapter 124, Portland. OR

Datacast framework is modular and can easily be extended and adapted to new applications (allowing experimentation) and new receivers (and transmitters). Part of the framework is a content-based subscription mechanism that utilizes the Smart card [like IBM's Javacard]. Using this smart card service, providers can implement a conditional access scheme that does not require a backchannel to some authorizing server. Also, mobile telephones can be combined with digital radio modules to provide an interactive return path allowing broadcasters to offer pull services (i.e., content requested by the user).

With the demand for Internet access and multimedia content growing at an explosive rate, datacasting is a way to compete with cable operators, phone companies and direct-broadcast satellite (DBS) in the broadband race. In particular, datacasting would allow broadcasters to deliver some of the most popular content on the Web, such as streaming media events that gobble up a lot of bandwidth and need to reach a mass audience.

Stay tuned – digitally tuned, that is: this is a medium whose potential is just beginning to be explored.

Sunday and The Philco

By Greg Petro

t a very tender age I became aware of the ritual of traveling to the city of Newark, New Jersey, for Sunday dinner at my grandparents walk-up apartment in the Clinton Hill section of the city.

From my earliest recollection, 213 Chadwick Avenue was a mystical and magical place. It was much like the black and white movies that I still watch, with actors from the thirties who were tough and rough, smoked cigarettes and drank whiskey by the shot. Chadwick Avenue was a tree-lined, cobblestone and brick city street, that made the car vibrate with a rhythm that I can still feel as part of the back seat ride to and from those Sunday excursions.

My maternal grandparents lived one story up, the apartment on the right, first door of 213 Chadwick Avenue. The steps from the front door foyer were wooden and old like they had never been new. The railings were wood with a heavy coat of wax that always had that stickiness about them. There was a light on each floor, high up in the ceiling and as a seven year old, I always wondered how the light bulbs would be changed, since they were so high and situated over the stairs.

My father would most likely park the car on the street in front of the walk-up, in a precarious position next to one of the mammoth oaks that lined the block every ten to fifteen feet. This alignment offered no access from the passenger side, so we would extricate ourselves from the car through the driver's side door with Mom sternly directing us to scurry to the sidewalk in between the swooshing cars, buses, and trucks that flew by during our musical chair exit.

Up the stone stoop steps, to the foyer, Mom would hit the buzzer, and we would magically be entered to the first floor. Up the stairs, lit by the single light bulb, and there at the top of the stairs was the source of the melodious smells of turkey, ham, roast beef and a host of side dishes that were never really explained as to their contents, and never discussed in terms of recipes.

A knock, "Come In!" and the apartment was alive with Grandma to the left, back in the kitchen, wearing a long bib apron from her neck to the floor, moving like a ballerina in the *Nutcracker Suite* on the stage of her kitchen. There was hustle and bustle like a train station. We learned at a very young age that everyone, especially the grandchildren, got a big hug within Grandma's ample bosom, and then we were to go visit with Grandpa, and stay out of the way of the final preparation of dinner, which at times resembled a swashbuckling sword fight with Grandma as Errol Flynn, swords ablazing.



Philco 46-420 image used by permission of Phil's Old Radios, http://antiqueradio.org/index.html,

At the age of seven, I would discreetly move slowly, cautiously, like a young pup approaching the alpha male, towards my grandfather. Joseph Aloysius Moran, Sr. was a small man, even to me. He had been in an auto accident years earlier and walked with two arm-length crutches that had metal bands that wrapped around his forearms. He was a beer drinker and pipe smoker, and the smells of the beer and pipe smoke hung thickly in his immediate area. Grandpa was my sage, storyteller, and expert on almost anything that I could conjure up to ask him. He spoke slowly and thought through what words he would use and then would stare at me, making me feel uncomfortable but important; he would speak "with me" as he spoke to the

grown-ups.

Dinner was served in the dining room, which was halfway between the front of the apartment and rear where the kitchen was. Grandpa sat at the head of the table, closest to the kitchen, while Grandma sat at the opposite end, farthest from the kitchen, which never made sense to me, since she was constantly commuting from the kitchen to the table. I sometimes got to sit next to Grandpa, to his right, but only on a few rare occasions.

Most of the time I sat on the far end of the table next to Grandma, and I always got to sit on the Newark phone book, a rather thick tome reflecting the importance of the City of Newark. The phone book was just the right size, and I was at just the right height to be at eye level with Grandma and everyone else at the table. It was like sitting on a hidden throne.

Of course, the tablecloth was white, starched, and we all had a matching white napkin, starched so stiff it would scratch my face. Sometimes I could smell Grandma in the napkin, and I knew she had just ironed them that morning or maybe just before we arrived. Dinner was served, eaten and cleaned away in the manner that everyone knew was the norm for my Grandmother, who had worked for many years as the head waitress at the Stork Restaurant, across from Military Park on Broad Street in Newark.

She moved with the grace of an Olympic figure skater, around, over and through the dishes, table, and even us, as we ate. I was always amazed how she could carry three, four, five dishes at a time and not one morsel of food would be disturbed. This was Grandma's Orchestra, and she was the conductor. Off with the apron, wipe her hands on the towel, fix her makeup while looking through the windowpane over the sink and Vroom! – There she was at the table "dining" with us all, looking like Marlene Dietrich, in that 1930s black and white movie I had fallen asleep watching, a week before.

There was always some elderly relative at Sunday dinner that I had never heard of; he

was usually very quiet with a white shirt and bow tie, slicked back hair and a tight moustache. This included Cousin Joe, Uncle Raymond or just plain "Vinnie." These relatives were never explained, nor were they ever seen, except at Sunday dinner. I never, to this day, have asked who they were, but they came, ate dinner, did not speak much and left quietly while never speaking to me nor I with them.

When dinner was completed, the table would once again be cleared as the head waitress conscripted the assistance of the other women to clear and present "the guests" (which included me) with some exotic dessert. These desserts were always sweet, with real whipped cream, but I never had any idea what they were. I have never had them since, but they were good. After dessert with coffee, I always got to share Grandma's coffee with lots of milk, and the women would surrender to the kitchen. The men vacated to the front parlor, where they would smoke and talk about work.

About this time, I knew this was the moment for Grandpa and I to return to the dining room. At the head of the dining room table, against the wall, was a large, fold-out, hutch desk. This was Grandpa's desk. He would turn his chair around from the dining room table and it would match up right where his desk was. In the corner to the right of the desk was a chair with the back cut off, which was used as a combination table and telephone stand for Grandpa. He would clear off this stool and I would pull it close to him and sit watching him do "his work" which was

usually smoking his pipe and reading some "important papers."

One Sunday night we stayed a little later, because there was a fight to be broadcast on the radio, and I would get to sit next to Grandpa at Grandpa's desk and listen to the boxing match, with Grandpa, on Grandpa's radio. His radio sat on the top shelf of the hutch desk and it was all I could do to see it on the top shelf. It was a brown Bakelite Philco that crackled and hissed as he tuned it in. The yellow light and the dial had long been covered with pipe tobacco smoke but Grandpa knew just how far to turn the knob to bring in "his" stations.

This Sunday night Joe Louis, the heavy-weight champion of the world, was fighting. As Grandpa told me, Joe Louis was the best fighter ever, and as Grandpa put it, "he was fighting another bum this month." Everyone else was either in the kitchen or the "parlor," as Grandpa found the fight on the Philco. I sat like a young plebe at West Point, on the cutoff chair next to Grandpa as he filled his pipe from the round metal can of pipe tobacco. The fighters were being announced and I could hear the crowd yelling and cheering. It was as if Grandpa and I were at the fight, sitting in the front row.

Grandpa looked for one of his regular stick matches to light his pipe and none was to be found in the many cubbyholes of his desk. I heard him say, "I need a match!" He got up and lumbered with his crutches around the corner to the kitchen and returned within

thirty seconds with a book of matches. As he returned, I heard the radio announcer counting, "seven, eight, nine, ten, he's out." Joe Louis had knocked out his opponent within the first thirty seconds of the first round.

Grandpa looked at me and asked. "What happened?' I said, "I don't know." We listened as the announcer explained, that once again Joe Louis had knocked out the challenger in the first round and he was still the heavyweight champion of the world.

Grandpa looked at me and said, "Son, you know what you learned from this?" I thought, here was my sage and aged mentor asking me a question, an adult question that I should listen to for the wisdom he was about to impart to me. I stared up at him from the stool as he put his hand on my bushy blonde head. He looked at me over his steel rimmed glasses, and said, "Don't ever go get a match when Joe Louis is fighting, because you'll miss the fight." He smiled, chuckled, and reached over and hugged me.

That night after the fight we drove home from the city. I laid down and snuggled up on the back seat, a little cold, watching the shadows alternately through the window up in the night sky and the imprints made on the backseat floor from the passing streetlights. Today was a special day; most Sundays at 213 Chadwick Avenue were. But this Sunday, I got to listen to my first boxing match with Grandpa and learned a valuable lesson ... I think.

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Beginner's Corner

Ken Reitz, KS4ZR kenreitz@monitoringtimes.com

A Beginner's Look at HF Digital Modes

nyone who's ever tuned around the HF bands will have come across the chirping and deedling sounds of digital communications. These sounds can be anything from crusty old hams pounding old time brass keys to tech-savvy operators using sophisticated computer-generated TV pictures. This month I'll take a beginner's look at the world of HF digital reception: the old, the new, the extremely expensive and the ridiculously cheap. But, first, the components.

Digital Receiving Basics

Naturally, you'll first need a decent short-wave receiver, but you may be surprised. I've had good results using an old Uniden 2021 portable shortwave receiver tuning in all types of digital modes. Of course, it won't be as selective or as sensitive as better receivers, but for the casual SWLer or beginner it's not a bad place to start.

If you're just starting out, look for a receiver with an adjustable BFO or a Single Sideband (SSB) switch since all digital action is transmitted in upper or lower sideband (depending on frequency). Also look for digital readout on the tuning display; this makes it very easy to tune in scheduled transmissions such as W1AW's RTTY and CW bulletins (see side bars). Look for external antenna terminals as an outside antenna will generally do a better job pulling in weaker signals and will pick up less interference than the built-in whip antenna.

And, when it comes to antennas for general all band HF work, it's hard to beat the Grove Tunerless All-Band antenna which I've mentioned many times in this column (see

BayPa'c

Model BP.2M

MultiMode

Fee to evrapsil

Tigertonics, Inc

BP-2M from Tigertronics does it all and at a reasonable price. Shown here with the cover removed to display the surface mount parts packed into the tiny modem. (Courtesy Tigertronics)

The Beginner's Corner October 2000 pages 30 & 31). It's cheap, easy to build and does a very good job receiving from 160 to 10 meters and, when you get your ham ticket, you'll find it's a great transmitting antenna, too, for 80 through 10 meters. For antenna lead-in wire use RG/8 mini coax cable.

Digital Decoding Gear

Boiled down to the bare essence, there are two ways to decode digital HF transmissions. One is to use a modem interface which goes between the audio output of your receiver and your computer. This method uses software you can either download from the Internet or load to your computer via a floppy or compact disk. The second method is to use a stand-alone digital decoder which has all the necessary software built into a box which goes between your radio output and a video monitor. Let's look at some options:

Inexpensive Modem

Using widely available shareware, these simple modems plug into an available com port on the back of your computer with a small cable which plugs into the speaker or headphone jack of your receiver. Newer computers will require an adapter to switch from 25 pins to 9 pins. One of the most readily available of these is from Tigertronics (http://www.tigertronics.com) which offers its BP-2M multi-mode modem. This is the fastest, cheapest and easiest way into the HF digital side of shortwave monitoring. See the review of this unit which I wrote in the December '99 issue of MT. The BP-2M lists for \$69.95.

Tigertronics also offers their SignaLink

SL-1+ which supports all available digital modes including voice. The addition of a front panel light display and digital voice capability makes this a great beginner's entry onto the digital scene. Hams will appreciate being able to send in all these modes as well as receive. The SignaLink SL-1+ lists for \$49.95.

MFJ Enterprises (http://www.mfjenterprises.com) also has a product similar to the BP-2M which covers FAX/SSTV/RTTY and CW in



SignaLink Model SL-1+ receives and transmits many digital modes. It even does Internet Repeater Linking (Echonlink). (Courtesy Tigertronics)



MFJ's 1214PC FAX/RTTY/ASCII/CW reader. A medium priced model for hams and SWLers alike. (Courtesy MFJ Enterprises)

a small plug-in modem. The model MFJ-1213 costs \$49.95.

The Middle Ground

MFJ Enterprises offers other multimode decoders capable of sending and receiving in the popular digital modes. Some models include built-in memory keyers for CW transmitting. The MFJ-1278B copies eleven digital modes including PSK31, Packet, PACTOR, AMTOR, RTTY, SSTV, WXFAX, ASCII, Navtex and CW. A model with built-in digital signal processing (DSP) is also avail-



MFJ's 1278B multi-mode handles 10 digital modes, is GPS compatible and is available with built-in DSP filters. (Courtesy MFJ Enterprises)

able. This option is very useful when trying to tune in weak signals or on crowded bands. Prices for these models start at \$309.95.

The Stand-Alone Option

These units are for serious digital hobbyists who have exhausted the use of the



Universal M-8000, the legendary full-featured digital demodulator comes with a legendary price tag. To do more you'd probably need top secret clearance! (Courtesy Universal Radio)

cheaper and less able models. Universal Radio sells several different models including the legendary M-8000 which carries a legendary price tag as well (discounted at \$1,299.00). The M-8000 does it all, but it's no place for a beginner. Still, it's good to know it's there in case you find yourself needing the ultimate in a digital demodulator or you win the lottery and there's no point in scrimping. Universal also sells used equipment and it's well worth checking out their web page for the latest bargains: http://www.universal-radio.com.

The Retro-Digital & DIY Option

For those stuck in another era there is the option of genuine Radio Tele-Type machines which have real keyboards and whose receivers clack away pounding out the copy on rolls of paper just like in the days of old. These machines are strictly for those with plenty of time on their hands and who have an interest in keeping these antiques going.

And, for the antique computer lover, check out the capabilities of the old Commodore C-64 and the Microlog SWL cartridge which decodes CW, RTTY, and ASCII. Try e-Bay or your local hamfest for these items which are typically priced under \$20. While writing this I had my old C-64 with the SWL cartridge plugged in and was monitoring CW and RTTY contacts on various bands. Viewed through a small TV set, it did quite well despite being 20 years old!

There are plans available to build a small modem device similar to the ones I first mentioned. *QST* magazine has an article entitled "A Flexible Digital-Mode Interface" which is found in the November 2000 issue pages 39-42.

Getting Started

All you have to do is decide which option you want and go for it. I like the BP-2M in particular for ease of operation, versatility and price. And, as a casual digital mode user it's all I want: CW, RTTY, FAX and SSTV. Monitoring the basic digital modes is a lot of fun and brings a new dimension to shortwave listening, one you've only heard before, but now you get to see.

And, finally, be sure to read Mike Chace's *Digital Digest* column each month on page 37 in this magazine. While it's written for the seasoned digital enthusiast, you'll learn a lot just by reading it every month. And now that you're a digital enthusiast yourself, why not go back over the previous issues of *MT* and find out what you've been missing!?

W1AW CW/Teleprinter Schedule

The American Radio Relay League (ARRL) headquarters operates amateur radio station W1AW from Newington, CT, and sends Morse code (CW) and radio teletype (RTTY) on a regular schedule. Content is often news of interest to all hams and includes updates on DX action, current solar conditions and general amateur radio news.

CW bulletins are sent each week day at 5, 8 and 11 pm (ET) and teleprinter bulletins are sent at 6 and 9 pm (ET). CW bulletins are sent at 18 wpm and it's one of the best ways to up-grade your code copying skills. They also send slow code practice runs each day with speeds ranging from 5 to 15 wpm. Frequencies for CW are: 1.8175, 3.5815, 7.0475, 14.0475, 18.0975, and 28.0675 MHz.

RTTY frequencies are: 3.625, 7.095, 14.095, 18.1025, 21.095, and 28.095 MHz. A complete schedule of all transmissions can be found at http://www.arrl.org/w1aw.html#w1awsked.

Amateur Radio RTTY & SSTV

With even the simplest of equipment you can tune in ham Slow Scan Television (SSTV) and RTTY QSOs from all over the country and the world. Follow the directions which came with your digital equipment for proper tuning and look for ham RTTY activity on the following band segments and frequencies based on FCC rules and ITU Region 2 band plans:

180 meters: 1.800-1.840 MHz

80 meters: 3.500-3.750 MHz (RTTY DX chan-

nel is 3.590 MHz)

40 meters: 7.080-7100 MHz (RTTY DX channel is 7.040 MHz)

30 meters: 10.130-10.140 MHz. (300 baud in AMTOR, ASCII and Baudot only.)

20 meters: 14.070-14.095 MHz

17 meters: 18.100-18.105 MHz (300 baud in AMTOR, ASCII and Baudot only)

15 meters: 21.070-21.090 MHz (300 baud in AMTOR, ASCII and Baudot only)

12 meters: 24.920-24.925 MHz 10 meters: 28.070-28.189 MHz

Look for SSTV in the HF ham bands centered around the following:

80 meters: 3.845 MHz 40 meters: 7.171 MHz 20 meters: 14.230 MHz 15 meters: 21.340 MHz 10 meters: 28.680 MHz Law continued from page 8

♦ Legal Afterthoughts

Realizing that they exempted most of the legal and legitimate users of police scanners, but neglected to protect their own, the law winds up with further exclusions for law enforcement agency chiefs, fire department chiefs, ambulance service directors, and paid or volunteer members of a fire department and paid or volunteer members of a public ambulance service licensed in Kentucky who have been given permission in writing by the chief of the fire department. These persons may possess a radio capable of receiving on a frequency allocated to a police department or law enforcement agency, whether the radio is in a vehicle or not.

The law concludes with what may perhaps be a loophole for all. The secretary of the Finance and Administration Cabinet is allowed to exempt the possession and use of any radio communication equipment that he finds the general public and other non-police persons may need for the proper operation of the NOAA weather radio system.

Whether such an order has been issued remains undetermined as we go to press, but, curiously, the exemption does not seem to require the equipment to be of the alert or alarm type that can be activated by a remote NOAA signal in times of weather emergency. Therefore, if such an order is issued, simply having the various 162.400 to 162.550 MHz frequencies in a scanner may possibly qualify it to be used for this NOAA radio exemption.

Race Scanning



Chapters:

- History of race comms.
- What you
- can hear Racing
- terms
- Racing flagsChoosing a
- scanner
- Tips and tricks
- Racing

frequencies

By Richard Haas, Jr. Listening to a scanner radio at the track adds a dramatic new element to the race fan's experience. This book will help you be properly equipped and informed to enjoy the race from a new perspective. Listen to, and understand exciting real-time transmissions from the driver's seat and support communications from behind the scene. Printed September 2003 with up-to-date frequencies. #0031 Only \$4.95 (+\$2.00 ship)



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MONITORING TIMES

Ask Bob

Bob Grove, W8JHD

bobgrove@monitoringtimes.com

Getting Started

- **Q.** Does the wind chill factor apply only to humans? Does this factor affect the temperature, say, of my car radiator? (Mark Burns, Terre Haute, IN)
- **A.** Wind chill factor is based on a normal (rather arbitrary) human skin temperature of 92 degree Fahrenheit (33 degrees Celsius). The normal evaporation of the skin's surface moisture is a cooling process that's why we sweat and it's accelerated by cold, dry wind. But for the wind to have any cooling effect beyond its lower air temperature, there must be surface moisture present on the surface to be cooled; there is on skin, but there isn't on your car's radiator. Thus, in the same wind, you will become chilled more than your car's radiator.
- **Q.** I have scanners capable of 2.4 GHz reception; can I receive 2.4 GHz phones on them? I am looking to buy a new cordless phone, and some sales people say they are all digital spread spectrum (DSS), but when you read the ads for different 2.4 GHz phones, some say DSS and some don't. So are some secure and others not? (Garth, email)
- **A.** By now, virtually all 2.4 GHz cordless phones are digital, and no, you can't eavesdrop on them with a scanning receiver. If there are any of the older, cheaper analog phones in operation, then yes, you can hear those. Before buying, read the specifications in the manual to determine whether it is a secure digital phone.
- **Q.** I just purchased a JRC NRD-545 shortwave receiver, H-800 Skymatch active antenna, and a Timewave ANC-4 Noise Canceller. While the H-800 outperforms my outdoor long wire antenna (fed by coaxial cable), both antennas are besieged by electrical noise interference.

My equipment is in the basement adjacent to my electric furnace, hot water heater, load center, etc. The ANC-4 works great with the longwire; can I use it with the H-800? (Rowland, email)

A. Since the ANC-4 works well with the outdoor wire antenna, we know the noise isn't penetrating the receiver through its case or other wiring; it's coming from the antenna. It would be best to put the ANC4 before the H800 amplifier unit in order to prevent noise pulses from overcoming the preamp's gain stage(s), but you can't do that, so try connecting it between the H800 output and the receiver.

And, as you are currently doing, always use coax cable between the radio and your out-door antenna; that's the first line of defense against electrical interference.

- **Q.** My dad used to tell me how he would alligator-clip the antenna lead from the old Philco to the finger hook of a dial telephone to improve reception. He said the phone lines acted as a huge longwire antenna. Is this still possible today, even without that fingerhook? (A. Peterson, Washington, DC)
- **A.** Actually, the technique still works fine if you can find a metal point on a modern phone to connect the antenna wire. Even though phone wires are grounded at various points, from a wavelength standpoint, the ungrounded lengths do a fine job of intercepting signals.

Look for a metal screw that may go into the phone's metallic mass, loosely (or even directly) coupling it to the phone lines. If that doesn't work, you can use a modular connector with a series capacitor as a voltage block (any nominal value .01 to .1 microfarad will work just fine), and tap an unused phone jack. Try each of the four different wires for best reception.

Q. I have an old Emerson table model radio with a square loop antenna glued to its back. I can only pick up stations when I place my hand on the back. I had previously taped down some of the wires that had come loose. Any ideas what the problem could be? (Dave Dameron, lowa)

A. These old loop antennas are actually part of the tuning circuit. There should be a trimmer capacitor, either on the loop itself, or on the chassis where it connects. To tune it properly, tune in a weak station at the top of the dial (1400-1700 kHz region) and peak the signal for maximum.

If you can hear background noise but the tuning capacitor has no effect, it's possible that:

- Some of the turns of the coil may be touching and electrically short-circuited, and they will need to be separated from each other with tape, wax or glue; or
- (2) A wire lead either to or from the loop may be broken; or
- (3) In an effort to "fix" the loop, some of the turns may have been removed; or
- (4) You are in a mobile home or distant from the broadcasting stations; or
- (5) The RF amplifier stage (assuming it has one) may be defective or need a tube replaced.
- **Q.** We recently bought a Radio Shack 2.4 GHz digital cordless phone. Even though it is not being used, it causes interference on a nearby AM radio. Does the phone emit a radio signal even though it is not in use? (Gene T. Schaeffer, Towanda, PA)
- **A.** No, but the microprocessor apparently does. Modern computerized electronics all utilize an internal time generator which is actually an oscillator. Depending upon the amount of shielding (or lack of it), unintentional signals may be radiated throughout a house.

You might try wrapping a few turns of the phone cord around a ferrite toroid or rod; such radio-frequency-interference (RFI) filters are available from Radio Shack and computer outlets as well.

Questions or tips sent to Ask Bob, c/o MT are printed in this column as space permits. If you desire a prompt, personal reply, mail your questions along with a self-addressed stamped envelope (no telephone calls, please) in care of MT, or e-mail to bobgrove@monitoringtimes.com. (Please include your name and address.) The current Ask Bob is now online at our website: http://www.monitoringtimes.com

Getting Started

Bright Ideas

Gary Webbenhurst P. O. Box 344, Colbert, WA 99005-0344

Last month I mentioned that an empty potato chip dip jar had potential for the radio desktop storage of parts, AA batteries etc.

One jar for those already charged, and another with those waiting to be recharged. But I noticed when only a few batteries remained in the jar, they fell over helter shelter. I found that a rubber band will hold the batteries upright, even with just a few batteries. Yes, I labeled the jars. I also found that an extra jar works to hold my cordless phone upright, and easy to grab. I am staying with my CIA coffee mug to hold my pens and rubber duck antennas. The jars are too short for that pur-

A friend brought over his radio and complained that it had gone "deaf." Before I reached for the tool kit, I checked it by changing to a different rubber duck. If there was still no audio, then I went to the basic external troubleshooting list:

Will the radio send audio out thru the speaker jack?

Has the BNC or SMA pin fallen out from the original rubber duck?

— Has the female BNC/SMA receptacle wall been damaged?

Does the volume control work normally, or has it been "locked out?"

_ Try fresh batteries

nose.

18

During all troubleshooting work, I keep the radio tuned to a strong station with continuous audio, such as the local 162 MHz NOAA weather channel. If it turns out to be any of the above problems, it is fixable. For example, if the BNC pin fell out, I cut off the end of a safety pin and it works fine. You just have to remember not to remove the antenna again! Damaged female receptacles can be bent inward, but be very careful on this process.

If the easy fixes are not the answer, one must ask if it is worth repairing at a professional repair shop or worth opening up the case yourself. If it is an old radio, it probably is not worth the effort or risk. It can then be "parted out" to your repair bench for future projects. The empty shell case might be a worthy addition to your collection of old scanners. Needless to say, I have quite a few in my collection.

If you are about to buy a new rubber duck for your handheld or a mobile antenna, check out these websites: http://www.northwestradio.com/interceptnw/antennas.htm or http://www.strongsignals.net/access/content/antenna.html. Remember to check that the BNC or SMA pin makes solid contact with your radio. If it does not, the gain in

your new antenna is worthless and may actually lessen your reception. There is no guarantee that the antenna from a third party vendor will mate up perfectly with your radio.

In a recent column I noted the arrival of a *new and updated* version of the DC power distribution strip from West Mountain Radio. Another source is newcomer Saratoga Radio Products from http://www.hamstop.com. MFJ has awakened from their slumber, and has responded with their new version of a DC power strip utilizing Anderson

Last month I noted the arrival of the new Red Cross Emergency Communications Response Vehicle to the Spokane, Washington, chapter. This is one of nine located around the country. I am writing a fea-

Power Poles. Next month, I will have a side by

for it! Here is another teaser: the vehicle comes

ture article about this vehicle. Watch

complete with several new nationwide frequencies. The list includes 453.425, 453.475, 453.525 and 453.575 along with their 458 input partners. These public safety frequencies are issued with a nationwide callsign, with secondary use status.



I downloaded a radio cheat sheet that someone put up on the web. It was very compact and crammed a lot into a small credit card size. It came with four point type. (Ouch, that *is* pretty small.) Nevertheless, I printed it out. I found it very useful, and decided to adapt some of my own cheat sheets to this smaller size. But alas, my Word 2002 program has no font sizes smaller than eight points. I went back to the original download, and copied the four point size template, and used it as the basis for my new cheatsheet. I also saved it to a template file called "four point font." Does anyone have a better workaround?

If you are a ham radio operator, or really into radios and electronics, you probably do a fair share of wire stripping for variety of needs. I use a quality, commonly available, wire stripper to

make the job quick and easy. But I noticed that my "cuts" were not as clean as I prefer. I took a look at the wire stripper tool and discovered a great deal of grime and dirt in the cutting channel, and also in the moving parts. Using an old toothbrush dipped in rubbing alcohol, I thoroughly cleaned the tool. I used a rag and then a cotton swab to make certain the area was clean and dry. I then added a couple of drops of gun oil into the critical moving parts. Whoa, it works better than new!

garywebbenhurst@monitoringtimes.com

If you don't own such a tool, you should. And remember that buddy that spent a whole Saturday helping you install a radio in your car? What a nice gift for any man who already has most things. Don't look at Radio Shack, but Graybar and their electronics parts/tool supply houses. Don't scrimp on this important tool: Buy the best! Here are some sources:

http://www.graybar.com http://www.mouser.com/ http://www.ssejim.co.uk/

http://store.yahoo.com/nsiradio1/

Back up your valuable data files and frequency lists by sending them email as an attachment to a friend. Obviously, you need to work this out with your friend who can then store these files on his/her computer. I also make a backup on a ZIP Disk and store it at another physical location.

25

Do you hold an FCC Extra class amateur license or know somebody that does? The ARRL offers a special 8x11 frameable ertificate for those who have ted the Amateur Extra class li-

cense: http://www.arrl.org/news/stories/2001/06/22/1/. Cost is \$7.50 for a ARRL member or \$10 for others. Contact the awards branch at ARRL with name, callsign, address, and year the Extra was earned. It makes a great special gift. I am still waiting for mine. (Hint, hint)

I often recommend the use of plastic freezer bags for traveling with radio accessories. I used a black permanent marker to label the contents. Here is an update: I bought a package of assorted brightly colored paper. I use the computer whele the computer whele

contents using the largest print size available (72-point type in my word processor). I then insert the sheet into the one gallon size bag (yes, it fits). It's a whole lot easier to read, with the contents in large type face.

Scanning Report

The World Above 30 MHz

Dan Veeneman

danveeneman@monitoringtimes.com

Choosing a Scanner

canners that can monitor trunked radio systems continue to be the hot topic as public safety agencies transition from conventional analog systems to new trunked radio networks. This month we'll take a look at the difference between various types of scanners and what it takes to monitor these new systems. We'll also check in on Nebraska and Michigan as we answer reader mail.

Scanner Types

Dear Dan,

Can you update a Bearcat 200xlt scanner to make it a trunk tracker? I didn't know if there were any modifications ...or if I would have to purchase one of the new Uniden models. Also, of the trunk trackers on the market, which one would you recommend? It's just for the home so I would like a base unit. I do attend NASCAR races but my BC200xlt works great for that. Thanks for the info.

Jeff via the Internet

Despite being more than 15 years old, I like the 200xlt and still use one. It works well, sounds great and is very easy to program. There are several modifications available for the Bearcat 200xlt, but unfortunately turning it into a portable trunk tracker is not one of them. The 200xlt is a conventional scanner, meaning it can scan a list of stored (programmed) frequencies but can only provide audio for analog signals on a single channel. It is not able to follow a trunked conversation that may jump from one radio frequency to another. Conventional scanners have three basic functional sections - manual control, allowing the user to enter frequencies, scan ranges, and other commands; a radio section capable of tuning across various frequency bands; and an audio section to deliver sound to the user.

Trunked radio systems transmit two basic kinds of information: voice traffic and control messages. The voice portion may be analog or one of several types of digital; the APCO-25 digital voice standard is one of those types. The control information requires a special decoder in order for the scanner to be able to interpret it. This is what the 200xlt is lacking – a control message decoder. It is possible to use a personal computer to perform this interpretation by connecting it to the dis-



criminator output of the scanner (the scanner requires a physical modification to do this), but the 200xlt would be a poor choice for this task. Current trunk tracking scanners have the control message decoder built-in, programmed for several different types of radio systems, and they are easier to carry around.

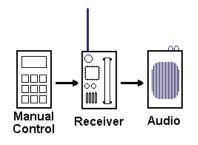
There are really two kinds of trunk

tracking scanners available today. The first type will automatically retune the radio to follow conversations on a trunked system though the use of an additional trunking controller section. The Uniden Bearcat 245xlt and the Radio Shack PRO-92 are two examples — they can track trunked systems but can only provide analog audio.

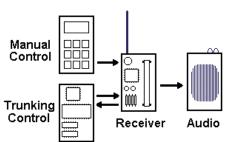
The second type of trunk tracker is a digital scanner, such as the Uniden Bearcat 296D and the Radio Shack PRO-96. These radios have yet another section, this one capable of decoding APCO-25 digital signals. In the first Uniden digital scanners, the 250D and 785D, this section was in a separate card, designated the BCi25. More recent models have the section already installed. In addition to following trunked conversations, these scanners can provide both analog and digital audio.

As far as a recommendation, I can say that I own a Radio Shack PRO-96 and I'm pretty happy with it. I live in an area with a number of busy APCO-25 systems and the PRO-96 does fine. I haven't had a chance to try out a Uniden scanner side-by-side, so I can't give you a first-hand report.

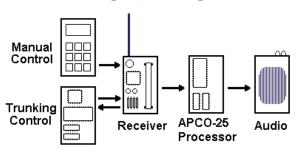
Conventional Scanner



Trunking Scanner



APCO-25 Digital Trunking Scanner



If you're not in an area with APCO-25 digital systems, or you don't have the interest in listening to them, you wouldn't go far wrong with a Uniden 245xlt or a Radio Shack PRO-92. I own both of these trunk-tracking scanners and each works well, but there are a few differences between them. For instance, the 245xlt has computer control while the PRO-92 can monitor LTR systems. Ultimately, the choice of scanner will depend on what you want to monitor, what type of communications systems those agencies use, and what scanner features are most important to you.

Firmware Updates

The APCO-25 decoder sections used in digital scanners are controlled by microprocessors. A microprocessor uses firmware (computer software stored in hardware) instructions to properly decode digital signals. As bugs are discovered or different trunked radio systems come into use, manufacturers may choose to update the firmware for a particular scanner. The firmware in these scanners is stored in flash memory and can be updated through a personal computer, similar to the way photographs can be downloaded from digital cameras.

Uniden Bearcat 296D and 796D

The Bearcat 296D is a new handheld digital scanner capable of monitoring APCO-25 systems. The 796D is the mobile/base version with identical capabilities. Back in early December some 296D and 796D users in Minnesota reported to Uniden that their scanners couldn't track conversations in the Hennepin County Sheriff's Department, which uses relatively high talkgroup numbers.

Uniden engineers confirmed that the scanners were unable to properly track any APCO-25 talkgroup greater than 4096. According to Uniden, at present only Minnesota uses talkgroup numbers that high. The engineers have created a fix that should correct the problem, but it requires an updated BCi96D digital card. Uniden promises to have more detailed information in the product support section of their website, which can be found at http://www.uniden.com.

At press time the download section of Uniden's web site listed a file named BCi96D.ZIP that contains a loader program to update the digital card. The loader data file had a date of December 24th, so presumably it contains the proper fix. I don't have a 296D or 796D so I haven't tried the fix myself, but I'd love to hear from someone who has applied the update.

Radio Shack PRO-96

There is also an effort underway to complete a firmware update for the Radio Shack PRO-96 scanner.

The vast majority of existing APCO-25 systems transmit information using a method called C4FM. The PRO-96 handles this method just fine. However, a handful of systems use a different method, called CQPSK. The PRO-96 doesn't handle this method very

well at all. Users typically experience a few seconds of clear audio, then garbled sounds and finally silence.

There is word that GRE (the manufacturer of the PRO-96) has been working for several months on an update that will allow the PRO-96 to operate properly with CQPSK systems. The developers have apparently run into a few problems but are confident that they will eventually find a solution. As of now, however, PRO-96 users trying to monitor CQPSK systems are out of luck.

Nebraska

Happy New Year, Mr. Veeneman!

Just a quick note to let you know that APCO P25 digital has come to Nebraska...

The county of Douglas, through a bond issue, recently upgraded its radio system to 800 MHz. The new system went up around mid-December 2003. It was an APCO P25 digital system and all conventional VHF/UHF frequencies went silent. Further, the county is allowing the licenses of the old frequencies

Motorola is the service provider. I am not sure of what kind of system it is, though it is probably a safe bet to say it is a 9600 baud, second-generation P25 system. Four towers are expected to provide countywide coverage.

As far as I know, three FCC licenses were taken out for the system with a combined 50 frequencies in the 820/860 regions. Maybe one or two control channels.

The Douglas County Sheriff's Department took the initial step. The city of Omaha (the largest city in the county and state) police/fire/emergency are scheduled to go on-line sometime this month followed by other departments in the county's remaining cities.

Sarpy County, immediately south of Douglas County, already has in place a Motorola 800 MHz analog trunked system. The Douglas County system is designed to allow these transmissions to be integrated into their radio plan.

Further, the state of Nebraska continues to be in discussion about planning a new statewide radio system, presumably 800 MHz, to replace the old Low/High VHF systems currently in use by the state/county enforcement officials. 95% statewide coverage is expected when a new system is installed as well as

interoperability with the Motorola 800 MHz systems in Douglas and Sarpy Counties and the 800 MHz Ericcson system in Lancaster (Lincoln) County.

Regardless, scanner enthusiasts in the state's most populous county with soon be unable to monitor public services frequencies with conventional scanners. Although, I do not know if Omaha will gradually phase out its UHF system until the switch actually occurs. Sarpy

frequencies and is still heard.

I'm not a die-hard scanner enthusiast and am unable at this time to have more definitive info for you. I believe, however, it is important to monitor public safety systems. Going all digital does seem a bit extreme. The Omaha Fire Department has one channel that can be encrypted for sensitive info. Douglas County and the City of Omaha, obviously, think otherwise. Until the price of digital scanners drop – and can monitor this system - I will wait in silence until I can purchase such a system.

As an aside, the Radio Shack Pro-96 digital scanner is available through special order at the stores in Omaha.

...Hope some of this can be useful to you and others. Thanks.

John in Omaha

Sarpy County, Nebraska

Sarpy County operates a Motorola system carrying both analog and digital traffic and uses 3600-baud control channels. The following frequencies are active: 856.2375, 856.9875, 857.2375, 857.9875, 858.2375, 858.9875, 859.2375, 859.9875, 860.2375 and 860.9875 MHz.

Here are some talkgroups on the Sarpy County system:

DEC	HEX	Description
48	003	Police - East
80	005	Police - Information
112	007	Police - West
144	009	Police - Common
176	00B	Bellevue Police Dispatch
208	00D	Police and Fire - 1
240	00F	Bellevue Police
1296	051	Papillion Police
1776	06F	LaVista Police (Dispatch)
2256	08D	Sheriff (Dispatch)
2288	08F	Sheriff (Tactical)
2608	0A3	Bellevue Police
3216	0C9	Fire East
3248	0CB	Fire West
3280	0CD	Bellevue Fire (Dispatch)
3408	0D5	Emergency Medical Services
3440	0D7	Emergency Medical Services
3952	0F7	Papillion Fire and Rescue
4496	119	Gretna Fire and Rescue
4528	11B	Gretna Fire and Rescue
4656	123	Gretna Fire and Rescue

Three 800 MHz frequencies are reported to be operating conventionally (not part of the trunked system). 866.0125 MHz



covers the central area of the county around Papillion and La Vista, 866.5125 MHz in the east and 867.0125 MHz on the west side. The county also does fire paging on 453.90 MHz and county-wide paging on 155.55 MHz.

Douglas County, Nebraska

Douglas County operates a fully digital Motorola system, operating APCO-25 protocols and using 9600-baud control channels. It's licensed for the following frequencies: 866.2375, 866.2750, 866.5375, 866.5625, 866.5875, 866.7875, 866.9500, 867.2250, 867.4125, 867.5875, 867.7125, 867.9625, 868.2125, 868.4500, 868.4750, 868.5125, 868.7000, 868.7250, 868.7625 and 868.9500 MHz.

The Omaha Police Department switched to this system in January, but apparently not many talkgroups are known.

2 3 5 6 7 8 11	002 003 005 006 007 008 00B 00C	Description Sheriff (Dispatch) Sheriff (Information) Omaha Police (Northwest) Omaha Police (Northeast) Omaha Police (Southeast) Omaha Police (Southwest) County Courthouse County Courthouse (Security)
60	03C	Ralston Police
602	25A	Omaha Police (Information)

Gaylord, Michigan

Hi Dan,

I just bought a new Uniden BC895XLT trunk tracker scanner. I live in Gaylord, Michigan, and was wondering if you knew any of the channels or frequencies that cops may be using.

Thanks, Don

In July of 2001 the dozen or so public safety agencies in Otsego County joined Michigan's Public Safety Communications System (MPSCS). MPSCS is a statewide digital trunked radio system that follows the APCO-25 standards. More than 10,000 radios are on the system, spread across 300 federal, state and local agencies.

More than 180 repeater towers provide coverage to about 97 percent of the state. Each tower will have anywhere from five to twelve frequencies, all transmitting in the range between 851 MHz and 869 MHz. One



of these towers is about seven miles northeast of Gaylord and is licensed for five frequencies: 866.0125, 866.3875, 867.3875 and 868.8875 MHz.



So, if you have one of the new digital scanners (Uniden BC250D, BC296D, BC785D, BC796D or Radio Shack PRO-96) you can program in those five frequencies and hear all the traffic, police included, that comes across the Gaylord tower. Below you find a list of police talkgroups that might be active in your area.

DEC	HEX	Description
1006	3EE	State Police (District 1)
1007	3EF	State Police (District 3)
1008	3F0	District 1 (Statewide)
1009	3F1	District 3 (Statewide)
1261	4ED	State Police (Aviation)
2005	7D5	State Police (District 2)
2006	7D6	District 2 (Statewide)
3003	BBB	State Police (District 5)
3004	BBC	State Police (District 6)
3005	BBD	District 5 (Statewide)
3006	BBE	District 6 (Statewide)
4002	FA2	State Police (District 7)
4003	FA3	District 7 (Statewide)
5027	13A3	Otsego County Police - Dispatch
5043	13B3	Gaylord Police
6002	1772	State Police (Upper Peninsula)
6003	1773	District 8 (Statewide)

Gaylord is also home to one of seven communications centers spread across the state; the others are located in Bridgeport, East Lansing, Negaunee, Northville, Paw Paw and Rockford.

If you're interested in other activity, I'm also informed that Gaylord schools can be heard on 155.235 MHz and that the County Hospital uses 155.280, 155.340, and 155.400 MHz.

San Diego, California

For those of you in southern California, the San Diego Metropolitan Transit Development Board has awarded Motorola a \$19 million contract to design and install a regional transit management system. The contract includes a digital radio network operating in 800 MHz that will support voice and

data communications, vehicle location and tracking, and automated mapping. The first users of the system are expected to be 500 buses run by the San Diego Transit Corporation and the North County Transit District. Eventually it may expand to include all bus and rail service in the greater San Diego area.

KosciuskoCounty, Indiana

Perhaps most famous for having a jail that outlaw John

Dillinger broke into in 1934 (where he stole handguns and bulletproof vests), Kosciusko County in northern Indiana is asking the Department of Justice for \$500,000 to get them onto an 800 MHz radio system. Indiana is implementing a statewide system in phases, and Kosciusko County wants to be ready as soon as possible. A new system would also allow police, fire and other emergency services to talk with each other, both within the county and with neighboring jurisdictions. The initial grant, however, would be used to get the sheriff's office and emergency management personnel onto 800 MHz. Fire and other services would come later. Long-term goals include the ability to transmit and receive data as well as voice, allowing text messaging and mobile access to criminal and other databases.

Under the plan the county of 75,000 people would have two repeater sites.

Currently the Kosciusko Communications Center in Warsaw dispatches all police, fire and emergency medical services in the county, with the exception of Syracuse. Interestingly, all 911 calls are recorded on DVD and are available for immediate playback. In the "old days" calls were recorded on reels of magnetic tape and it could take quite some time to retrieve a particular call.

Until the 800 MHz system is in place, you can check the following frequencies. County Sheriff dispatch is on 154.845 with additional traffic on 154.150, 154.890, 156.150, 155.130 and 158.865 MHz. County fire is dispatched on 154.340 MHz, while Warsaw Fire is on 151.460, 153.890, 154.280 and 155.340 MHz. Warsaw Police use 155.670 and 155.970 MHz.

Washington, D.C.

Dear Dan,

The description of the upgraded police communications system for Washington, D.C. in your column in the December 2003 Monitoring Times was especially interesting to me. As a teenager living in D.C. in the 1930s I used to monitor the Metropolitan Police station WPDW on 2,422 kilocycles (not kilohertz!). I used a Philco Model 635 all-wave receiver that I had modified with a relay squelch circuit to mute the audio when no signal was received.

Initially, the Washington system was oneway, with no transmitting capability in the squad cars. WPDW at times transmitted messages to cruisers in the adjacent Maryland county of Prince Georges. Eventually the cars were given talkback capability via FM transmitters on 37.220 megacycles, with the dispatcher still transmitting on 2,422 kilocycles. I believe that this transmitter was located at the 10th Precinct, somewhere in northwest Washington.

Perry in Winchester, Virginia

Thanks Perry! I'd love to hear about other police radio systems from before World War II, so if you have a story to tell or photos to send in, please drop me a line!

That's all for this month. More information is available on my website, including detailed APCO-25 information and links to Uniden for scanner firmware updates. Please send your questions, comments and frequency lists to me at <code>danveeneman@monitoringtimes.com</code>. Until next time, happy scanning!



Scanning Canada

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Ham-Ex Time Again



The OBRY tracks and the hairpin at Forks of the Credit.

espite continuing uncertain weather we Canadians know that spring is just around the corner. One of the harbingers of Canada's shortest season is that growing annual hamfest known as Ham-Ex. Formerly a modest amateur radio flea market in the northwest suburbs of Toronto, it has grown into a major event attracting hams, shortwave listeners, scannists and CBers from all across Central Canada.

Ham-Ex is sponsored jointly by southern Ontario's Peel and Mississauga Amateur Radio Clubs. Prior to last year the event was a morning flea market running in parallel with a seminar program and amateur radio examinations. Taking their cue from a steadily growing attendance, the organizing committee decided to expand the event into an all day affair.

The new format saw its debut in 2003. Committee members and volunteers were at their posts before seven in the morning. The doors were flung open to an eager crowd of flea market bargain hunters at nine. Pickups, vans and car trunks filled up with the spoils of the first major flea market of the year until around noon, then the program of seminars was fired up to keep enthusiastic radio aficionados busy until the end of the afternoon. Following a short break, an evening banquet with guest speaker Jim Dean, Vice President of Regulatory Affairs with Radio Amateurs of Canada, closed off the event some fifteen hours after the first volunteers arrived.

This year Ham-Ex once again headlines the opening of the amateur radio spring season. If you can make the trip to the Brampton Fall Fairground in Caledon, Ontario, on Saturday March 20th you will be most welcome. I'll be there and I look forward to meeting some *Monitoring Times* readers at the event. I'll be wearing my callsign name tag (VA3KOT). If you manage to find me among the milling throng please introduce yourself.

The event site is on Heart Lake Road which is the continuation of highway 410. The Brampton Fall Fairground is just a few short kilometers north of the end of the highway. Ham-Ex will be well signposted, but the army of callsign license plates and mag-mount vehicle roof antennas in the large free parking lot on the west side of the road will be a dead giveaway that you have arrived.

This year's format will be a repeat of last year's successful event with a morning flea market, all-day exhibits from AMSAT,

ARES (Amateur Radio Emergency Service), the Canadian Red Cross, St John Ambulance Brigade and other emergency service groups. Amateur radio examinations will be held starting in the morning. (Come on, SWLs and scanning enthusiasts, make this the year you take the plunge and get licensed). The evening banquet will feature a keynote address by Donald Courcy, Spectrum Management Officer of Industry Canada. Here is an opportunity to put the fed's spokesman on the spot and get answers to your questions about the radio spectrum in Canada.

Further Down the Line

March is the big month for Ontario's Town of Caledon, it seems. In addition to the annual invasion of radio enthusiasts at Ham-Ex, *Scanning Canada's* rail journey along the Orangeville Brampton Railway line also takes us into Caledon this month.

The town proudly proclaims its fame as the greenest town in Ontario. The main topographical feature of the town is the Niagara Escarpment which separates the southern portion bordering on Brampton (where we will visit next month) from the northern portion at the top of the escarpment. The Niagara Escarpment runs 725 kilometers from Niagara Falls in the south to Tobermory at the tip of Ontario's Bruce Peninsula in the north. The escarpment cuts through the middle of Caledon, pushing the northern section up about 1000 feet higher above sea level than the City of Toronto some 80 kilometers to the southeast.

This is great antenna country. There is only one tower in southern Ontario that can see up and over the edge of the escarpment and that is Toronto's CN Tower. Radio enthusiasts in Caledon have a natural thousand-foot height advantage over city dwellers, and that really makes a difference for DX reception.

But, back to the rail line. The tracks have to make their way down the steep escarpment on their way to their junction with the main CN tracks in the city. At a picturesque point near the hill called the Devil's Pulpit, the tracks cross a traditional wooden trestle bridge traversing the confluence of the two arms of the Credit River. There is a hairpin bend in the road beside the rail line at the point called "Forks of the Credit."

The scenery here is very typical of most

people's mental image of Canada – steep slopes, a swiftly flowing river and a traditional railroad trestle bridge. Perhaps for this reason the location has been used for filming scenes from the popular Canadian TV show "Due South."

The railroad frequencies used by the Orangeville Brampton Railway company were listed in last month's column. These frequencies are quite active on Tuesdays and Thursdays when freight trains use the line. This month's frequency list is for the Town of Caledon.

Hydro One Networks Inc 72,420

Brampton Flying Club (Caledon) – Canada's largest private flying club

123.300, 123.450

CIDC FM Tower (CIDC FM broadcasts on 103.5 MHz) 151.250 411.7375 Province of Ontario

(GMCO) 159.660 164.820 167.100 931.4375 931.6125 931.6875 931.9375 Rogers

931.6125 931.6875 931.9375 Rogers
Paging
Canadian Pacific Pailroad

Canadian Pacific Railroad

159.885 160.935 161.115 161.175 161.415 161.535 896.9375 935.9375 School Buses

162.435 Parkview Transit

167.265 408.1625 Laidlaw Transit

Town of Caledon

72.100 Town Hall

169.155 169.755 Roads Dept

Respond Ememrgency Communications

Search & Rescue 172.470 172.980

Caledon Ski Club

172.500 172.590

Clublink - Bolton Golf Club

(good for knowing when the course marshalls

are coming) 451.1875 451.

1.1875 451.6625 458.6625

462.5625 469.2625 Peel District School Board

458.6625 469.2625 Region of Peel, Victoria Yard

821.0875 821.1875 821.2125 821.3375 821.4375 821.6875 821.7125 821.8375 821.9375

821.9625 822.0875 822.1875 822.2125 822.3375 822.5875 822.6875 822.8375 822.9375

822.6875 822.8375 Region of Peel

440.2875 445.2875 928.84375 952.84375

Province of Ontario (GMCO)

152.000 (very active) 419.4125 Caledon Fire Tower 149.440 Bolton MTC Tower

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Utility World

HF Communications

Hugh Stegman

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AFRTS/AFN Confusion Continues

everal months after the American Forces Radio/TV Service (AFRTS) announced new frequencies for the Navy's shortwave rebroadcast of AFRTS and the American Forces Network (AFN), things are still pretty confused.



The AFN web site shows the following new frequencies, which are all upper sideband (USB) and in kilohertz (kHz):

Diego Garcia (Indian Ocean): 12579 day, 4319 night (all nights are local time at the transmitter)

Guam (West Pacific): 13362 day, 5765 night Pearl Harbor, Hawaii: 10320 day, 6350 night

Key West, FL: 5446.5 and 12133.5, 24

Roosevelt Roads, Puerto Rico: 7507, 24 hours

Keflavik, Iceland (North Atlantic): 13855, 24 hour

Immediate confusion was caused by Diego Garcia's listing for 12579, which is an international MSI (Maritime Safety Information) frequency using narrowband direct printing in SITOR-B (Simplex Telex Over Radio, mode B). This particular frequency is used every day by the US Coast Guard, among other agencies worldwide, to comply with treaties regarding the safety of life at sea. They're still sorting this one out.

Keflavik, a military base in Iceland, was not heard right away, but Klaus Betke was able to confirm it from Scandinavia on New Year's Eve. 13855 is indeed the right frequency.

For the longest time, there was some dispute over whether the US transmitter was at the Key West communication site, or the big Rosey Roads base in Puerto Rico. In this band plan, though, all three frequencies have been reported as up simultaneously.

All the confusion is probably due to the fact that AFRTS has always been pretty much out of the loop on this particular broadcast. At the very beginning, in fact, they thought someone had pirated their downlink. This is why it's never a good idea to try and get a verifica-

tion ("QSL") from AFRTS itself. AFN lists an e-mail address of QSL@mediacen.navy.mil.

The content of this broadcast is a pickup of the AFRTS/AFN "interruptible voice channel." It's a dump from the satellite downlink to

HF (high frequency, nominally 3-30 megahertz). This was originally done in order to fill gaps in the Navy's DTS (Direct To Sailor) entertainment system. Years



later, though, the rebroadcast continues. It has proven simple and effective, as HF usually does.

The "interruptible" part refers to the fact that the "voice channel" can be broken into for special programs such as ball games. There are actually several program channels going out at once, and so the content on HF can be kind of unpredictable. Sure is nice to miss all the commercials, though.

New Beacon Oddities

It appears as if the Russian single-letter beacons are no longer alone. A number of other such devices have been discovered on high frequency (HF, 3-30 kilohertz). They are unlicensed, and using frequencies that probably make them pirates under the letter of FCC Part 15 regulations. Their purpose is a total mystery.

One group has posted a list of its frequencies to a pirate radio group on the Internet. They claim to have operated many very low-powered radio beacons in the more remote desert regions of California and Arizona "for a few years now." All are said to be solar powered, with most going to a battery at night. Typical power output is said to be 100-200 milliwatts, rather low for HF. Emission is CW (continuous wave or A1A), and the frequencies are crystal controlled.

A closely-spaced group of five beacons, reminiscent of the Russian "clusters" believed to be used for propagation sounding or direction finding, are between 4095 and 4096 kHz. Three of these have been found here, in Los Angeles. The loudest one, on 4095.54, sends Morse code dits (dots) of varying numbers and speeds, plus the Morse letter "W" every 11 seconds. 4096.27 kHz sends long dashes, actually a carrier switched one second on, one second off. Finally 4096.6 sends long dashes of varying lengths.

Also loud here is the single-letter "S" bea-

con (same identifier used by Marconi's first transatlantic test). Frequency is given as 8000.55 kHz, but it measures at 8000.63. It only transmits in day time, when the sun is shining.

Finally, there's one on or near 6700 kHz. It's only heard sporadically here, sending odd strings of dits.

It's probably worth some listening to determine whether these interesting transmissions could be some kind of telemetry, changing in proportion to anything such as temperature or battery charge. If nothing else, their ultra-low power certainly makes for good propagation soundings.

Just so people outside the southwestern US won't feel left out, there have been reports of a pirate beacon in the British Isles. This one appeared on 499.25 kHz in December, repeating the Morse code loop, "CQ CQ CQ DE BDN BDN BDN HAPPY NEW YEAR."

"CQ" is of course the Morse code callup for "hello all stations," and "DE" is the procedural signal for "from." The callsign "BDN" sure sounds like the reverse of "NDB," the official generic designator for a "Non-Directional Beacon." Real navigation beacons don't call "CQ," though, and needless to say they never, ever, wish us any kind of holiday greetings. Increasingly, they send Differential Global Positioning System data streams, and don't say anything intelligible to humans at all.

Other pirate beacons have been reported on 6925 (letter "C") and 6135 kHz.

Coastal Station List

There are a few additions and corrections to the list of maritime public coastal stations published in the January column.

Change the status of KLC, Galveston Radio in Texas, from uncertain to closed, sometime in the '80s. Some of its frequencies were taken over by other stations and the letters are currently used as an identifier name by KLCR, a low-power station at Lewis & Clark College in Oregon.

Add RLK7, another callsign used by Arkhangelsk Radio in Russia. Add UFA, Batumi Radio, Georgia, Russia. Tentatively add UTM, Feodosia Radio, in the Ukraine. It's still being reported, but not often.

Finally, add A4M, Muscat Radio, in Oman. With these changes, we have a pretty good accounting of what's up in maritime coastal radio.



Utility World

Hugh Stegman

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ABBREVIATIONS USED IN THIS COLUMN

AFB Air Force Base
ALE Automatic Link Establishment
ARINC Aeronautical Radio, Incorporated

ARQ Automatic Repeat Request teleprinting system
CAMSPAC Communication Area Master Station, Atlantic
Coq-8 Coquelet-8, French teleprinting system
CW Morse code telegraphy ("Continuous Wave")
DEA US Drug Enforcement Administration

DSC Digital Selective Calling
EAM Emergency Action Message

FAX Radiofacsimile

FEC Forward Error Correction teleprinting system
HF-GCS High-Frequency Global Communications System
Joint Surveillance Target Attack Radar System
LDOC Long-Distance Operational Control

LDOC Long-Distance Operational Control
MARS Military Affiliate Radio System
Meteo Meteorological
MFA Ministry of Foreign Affairs
MWARA Major World Air Route Area

MX Russian single-letter beacons/channel markers

PACTOR Packet Teleprinting Over Radio

PR Puerto Rico RSA Republic of South Africa

RTTY Radio Teletype

SAM Special Air Mission (Distinguished Visitors)
SHARES Shared Resources, US federal net
SITOR-A Simplex Teleprinting Over Radio, ARQ mode
SiTOR-B Simplex Teleprinting Over Radio, FEC mode

UK United Kingdom
Unid Unidentified
US United States

All transmissions are USB (upper sideband) unless otherwise indicated. All frequencies are in kHz (kilohertz) and all times are UTC (Coordinated Universal Time). "Numbers" stations (encrypted, usually unidentified, broadcasts thought to be intelligence-related) are identified in () with their ENIGMA station designators, as issued by the European Numbers Intelligence Gathering and Monitoring Association.

- 490.0 C-Portpatrick, UK, SITOR-B wind warnings at 2020. G-Monsanto, SITOR-B weather and navigation warnings in Portuguese, at 2100. (Day Watson-UK)
- 2182.0 VAK-Canadian Ćoast Guard, St John, NB, announcing upcoming broadcast on 2749, English and French, at 0139. (Rick Baker-OH)
- 2187.5 002241078-Madrid, Spain, with a DSC all-ship call, listening on 2182, at 0031. 002510100-Reykjavik, Iceland, DSC at 0202. 002371000-Olympia Radio, Greece, DSC at 0226. 232002774-GFKA, British vessel Blackfriars, DSC test with UK Coast Guard, Milford Haven, at 0754. (Watson-UK) 533529000-9MEA7, vessel Alam Bitara, calling Malaysia in DSC, at 0755. (Patrice Privat-France)
- 2250.0 OWI-Dutch Air Force, Aalborg, working OWF, Skrydstrup, also using 2531, 3291, and 4841, all in ALE, at 2249. (Watson-UK)
- 2461.5 OA-Irish Navy, Haulbowline, working ships in SITOR-A at 2338.
- 2598.0 VOK-Canadian Coast Guard, Goose Bay, Labrador, with Marine Information Broadcast at 0137. (Baker-OH)
- 2617.0 GYA-UK Royal Navy, Northwood, FAX weather charts at 2315. (Watson-UK)
- 2670.0 "Activities"-US Coast Guard, working vessel Atlantic Queen, at 0415. VCO-Canadian Coast Guard, Sydney, NS, Marine Information Broadcast at 0040. (Baker-OH) US Coast Guard Group Charleston (SC), information broadcast at 1108. (Mark Cleary-SC)
- 2682.4 CFH-Canadian Forces, Halifax, NS, weather in RTTY at 0350. (Ron Perron-MD)
- 2899.0 Shanwick-North Atlantic MWARA control, Ireland, position from Delta 64, at 0650. Shanwick, position from American 84, at 0659. (Allan Stern-FL)

- 3137.0 IKF-US Air Force, Keflavik, Iceland, ALE call to ICZ, Sigonella, Italy, at 2306, and HAW, Ascension Island, at 2317. (Watson-UK)
- 3155.0 OB1P-Lithuanian military, working MS2Z in ALE at 1709I. (Watson-UK)
- 3476.0 Gander-North Atlantic MWARA, Canada, handing Delta 665 off to Shanwick, at 0333. (Stern-FL)
- 4364.5 3AC-Monaco Radio, PACTOR-II traffic list at 1655. (Watson-UK)
- 4469.0 Florida Cap 1030-Civil Air Patrol, checking stations into wing net at 0130. (Stern-FL)
- 4604.0 Columbus 4-Ohio Civil Air Patrol, calling any Red Thunder (OH), Red Robin (MI), and Blue Mound (WI), no joy, at 2334. (Perron-MD)
- 4739.0 Cardfile 712-US Navy, working Fiddle (USN, Jacksonville, FL), at 0503. (Cleary-SC)
- 4755.0 RCV-Russian Navy, Moscow, working RHV42 in CW, at 1850.
- 4777.3 IMB51-Rome Meteo, Italy, FAX weather charts at 1918. (Watson-
- 4996.0 RWM-Moscow, Russian, with CW standard time pips at 1814. (Watson-UK)
- 5465.8 "R"-Russian Navy, Ustinov, CW single-letter marker beacon (MX), at 2156. (Watson-UK)
- 5500.0 H6W-Moroccan police, calling AOP and L9X, also using 6922, 7635, 8942, 9285, and 10900, all ALE, starting at 0749. (Watson-LIK)
- 5616.0 Gander-North Atlantic MWARA, Canada,, position from Amtran 442, at 0504. (Stern-FL)
- 5696.0 Rescue 1500-US Coast Guard, working CAMSLANT and NMN37, CG Group Ft. Macon, GA, on a rescue at 2012. (Baker-OH)
- 5732.0 Coast Guard 1712, passing position and ops-normal to CAMSPAC, CA, at 0104. (Cleary-SC)
- 5850.0 OXT-Copenhagen Meteo, with notice in frequency-shift Morse that station will discontinue FAX ice charts on 1 Jan 2004, at 0945. (Watson-UK)
- 6449.7 PWZ-Brazilian Navy, Rio de Janeiro, RTTY navigational warnings in Spanish, at 2200. (Bob Hall-RSA)
- 6491.5 LOR- Argentina Navy, Puerto Belgrano, with RTTY weather in Spanish, simulkeyed on 8303, at 0004. (Hall-RSA)
- 6637.0 Miami Radio-ARÍNC contract LDOC, FL, working Amerijet 710, at 1108. (Stern-FL)
- 6640.0 New York-ARINC LDOC, patching US Air 782 to company dispatch at 0345. (Stern-FL)
- 6697.0 Twilight-US military, with EAM simulcast on 8992, 11244, and 13155, at 0437. (Jeff Haverlah-TX)
- 6700.0 OCEANO-Mexican Army, ("Ocean"), calling SELVA (Forest) at 1024, and TIBURON (Shark) at 1110. (Watson-UK) [Mexican scrambled voice heard here too. -Hugh]
- 6721.0 Reach 0177-US Air Force Air Mobility Command, with ALE-initiated patch to Charleston AFB, at 1517. (Cleary-SC)
- 6761.0 Palm 91-US Air Force, arranging refueling track with Steel 72, at 2353. (Cleary-SC)
- 7527.0 Hammer-US Customs Service, working aircraft Omaha 297, at 1224. (Cleary-SC)
- 7633.5 Reach 6307-ÚS Air Force, making a morale patch at 2300. (Cleary-SC)
- 8337.6 Shark 11-US Coast Guard, working 17C and cutter Harriet Lane, at 0016. Shark 13-Probably US Coast Guard, tracking Haitians
- near "Batcave" at 2351. (Cleary-SC)
 8414.5 23909200-SKYV, Swedish vessel Karoline, DSC test with 003669995, US Coast Guard CAMSLANT, VA, at 2151. (Watson-LIK)
- 8578.0 ANTARNET01-unknown station, working ASSEDNET01, in an ALEinitiated data exchange, at 1404. (Watson-UK)
- 8807.5 3AC-Monaco Radio, PACTOR-II traffic list at 1633. (Watson-UK) 8912.0 Coast Guard 1717-US Coast Guard, position report for Predator 1
- (PR), at 1333. (Cleary-SC) 8942.0 007-ARINC Ground Station, Shannon, Ireland, identifying in HFDL at 1544. KE0502-Korean flight giving HFDL position at 1545.
- (Watson-UK)
 8971.0 Archer 21-Unknown US military, working Fiddle (US Navy, FL), at
- 2015. (Cleary-SC) 8977.0 SU0118-Aeroflot A320 VP-BDK, HFDL position at 1939. (Privat-
- 8977.0 SUUTT8-Aerotiot A320 VP-BDK, HFDL position at 1939. (Privat France)



Utility Logs

Continued

- 8983.0 Coast Guard 2102-US Coast Guard, being diverted by CAMSLANT to search for a drifting vessel, at 1954. (Cleary-SC) Coast Guard 2105, in a search and rescue of sinking motor vessel *Dizzy*; Air Force rescue helo also enroute, at 2115. (Stern-FL)
- 8992.0 Reach 9011-US Air Force, patch via Andrews HF-GCS for weather, at 1521. (Cleary-SC) Steel 71-US Air Force, probably a tanker, receiving coded messages from Offutt HF-GCS, NE, at 1535. Override-US military, calling Skymaster (US Strategic Command tactical call), followed by a "3-6-9" message simulcast on 11244, at 1954. Repudiate-US military, patch via Puerto Rico HF-GCS to "Command Center," to whom he passed a "3-6-9" message in 8 groups, at 2042. (Haverlah-TX)
- 9007.0 Canforce 2395-Canadian Forces aircraft, getting North Atlantic weather from Trenton Military, at 2333. (Cleary-SC)
- 9025.0 Coast Guard 1717-US Coast Guard, with ALE-initiated patch to Clearwater Air, FL, regarding a search, at 1254. (Cleary-SC) 291191-US Air Force C-17 89-1191, ALE sounding at 1347. (Privat-France) IKF-US Air Force, Keflavik, Iceland, working ICZ, Sigonella, Italy, in ALE at 1600. (Watson-UK)
- 9040.7 5YÉ-Nairobi Meteo, Kenya, coded RTTY weather observations, at 0112. (Hall-RSA)
- 9106.0 HHS-SHARES station WWD58, US Department of Health and Human Services, sounding in ALE, at 1551. (Perron-MD)
- 9226.7 Unid-Egyptian Embassy, Berlin, Germany, with encrypted message in SITOR-A, at 1624. (Watson-UK)
- 9982.5 KVM70-Honolulu Meteo, FAX weather charts at 1525. (Watson-UK)
- 9996.0 RWM-Moscow, standard time pips in CW, at 1545. (Watson-UK)
 10033.0 Houston Radio-ARINC contract LDOC, TX, working West Indian
 79. at 1520. (Stern-FL)
- 10075.0 Houston Radio-ARINĆ contract LDOC, working United 883, at 2034. (Perron-MD)
- 10242.0 Omaha 3SA-US Customs Service, tracking a target with Hammer, at 2008. (Cleary-SC)
- 10536.0 CFH-Canadian Forces Meteo, Halifax, NS, weather in RTTY, at 1500. (Privat-France)
- 10780.0 Cape Radio-US Air Force Eastern Test Range/HF-GCS, patching Razor 22 (E-8C JSTARS) to Peachtree Ops, Warner-Robins AFB, GA, at 1803. (Stern-FL) Razor 22, patch to Peachtree Ops at 1828. (Haverlah-TX)
- 10993.6 Herk 20-US Coast Guard, setting radio guard with Key West, at 2058. (Cleary-SC)
- 11175.0 Cacti 61-US Air Force, probably a tanker, came from erroneous 11176 frequency, this time raised Keflavik for a signal check, at 0015. Puerto Rico-US Air Force HF-GCS, came from 8992 with SAM 6717, at 0752. (Haverlah-TX) Puerto Rico working AMC 237 at 2351. (Stern-FL)
- 11176.0 Cacti 61-US Air Force, calling Mainsail (group call: any ground station this net) on the old frequency (which he called 11175), no joy, at 0013. (Haverlah-TX)
- 11220.0 Fish Pond-US military, troubleshooting data mode with Andrews HF-GCS, at 2105. (Cleary-SC)
- 11232.0 Canforce 4478-Canadian Forces, patching Wing Ops via Trenton, at 2255. (Cleary-SC)
- 11244.0 McClellan-US Air Force, CA, with a 110-character EAM simulcast on the HF-GCS frequencies, at 1909. Offutt-US Air Force, NE, same 110-character EAM at 2020. (Haverlah-TX)
- 11309.0 New York-North Atlantic MWARA, position from Air Portugal 1437, at 2047. (Stern-FL)
- 11330.0 New York-North Atlantic MWARA, working Gofer 07 (MN Air National Guard C-130E), at 1710. (Stern-FL)
- 11396.0 New York-North Atlantic MWARA, handing US Air 1745 off to San Juan, PR, on 134.3, at 1718. New York, position from American 679 at 1723. (Stern-FL)
- 11494.0 17C-US drug interdiction, working Panther (DEA, Bahamas), at 1843. (Cleary-SC)
- 12560.0 UCON-Russian vessel Pioner Moldavi, Russian SITOR-A traffic for Arkhangelsk, at 1400. (Privat-France)
- 12577.0 636006270-D5FQ, Liberian bulk carrier African Azalea, DSC at 0815. (Hall-RSA)
- 12669.0 LOR-Argentina Navy, Puerto Belgrano, with RTTY world news in Spanish, at 1800. (Hall-RSA)
- 13110.0 WLO-Mobile Radio, AL, traffic list and schedule, at 2200. (Stern-FL)

- 13155.0 Mill Pond-US military, with two 28-character EAMs, simulcast on 6697 and 11244, at 1536. (Haverlah-TX)
- 13200.0 Bolt 21-US Air Force tanker, patch via Puerto Rico HF-GCS to Lightning Ops (MacDill AFB, FL), at 2248. (Cleary-SC)
- 13306.0 New York-North Atlantic MWARA, working Virgin 167 at 1845. (Stern-FL)
- 13354.0 New York-North Atlantic MWARA, position from Virgin 31, at 8832. (Stern-FL)
- 13357.0 Recife/Atlantico-South Atlantic MWARA control, Brazil, working Varig 1167 in English and Portuguese, at 2007. (Perron-MD)
- 13510.0 CFH-Canadian Forces Meteo, Halifax, NS, with RTTY Terminal Aerodrome Forecasts, at 1730. (Privat-France)
- 13927.0 AFA1EN-US Air Force MARS, IN, medical patch with Air Evac 950, at 1730. (Stern-FL) Teal 40-US Air Force Reserve weather observation WC-130, morale patch via MARS AFA3HS, at 2054. (Cleary-SC) [This unit works some winter storms as well as the betterknown summer hurricanes. -Hugh]
- 13993.0 AFA1BV-US Air Force MARS, checking into transcontinental net at 1800. (Stern-FL)
 14408.0 Reach 883Y-US Air Force, morale patches via MARS AFA1EN, at
- 14408.0 Reach 883Y-US Air Force, morale patches via MARS AFA1EN, at 1917. (Cleary-SC)
 15010.0 Halifax Military-Canadian Forces, calling NE4V at 1237. (Cleary-
- SC)
- 15025.0 SU0584-Aeroflot A320 VP-BWE, HFDL position at 1436. (Privat-France)
- 16745.2 Unid-SİTOR-B news broadcast, probably Philippines, at 1601. (Perron-MD)
 16799.0 Unid-SITOR-B news broadcast, probably Philippines, at 1345.
- (Perron-MD)

 16821.0 VRX-Hong Kong Radio, working vessels in SITOR-A at 0904.
- (Watson-UK)
 16822.5 UDK2-Murmansk Radio, Russia, working ships in SITOR-A at 0914.
- (Watson-UK)
 16829.5 UCE-Arkhangelsk Radio, Russia, working a ship at 0932. (Watson-
- UK)
 16840.5 RRR34-Moscow Radio, Russia, working a ship in SITOR-A, then
- traffic list in SITOR-B, at 0952. (Watson-UK)
 17147.0 URL-Sevastopol Radio, with CW messages in very fast machine-
- sent Russian, at 1607. (Hall-RSA)
- 17206.0 IAR-Rome Radio, Italy, CW bulletins in English and Italian, at 1308. (Perron-MD)
 17487.0 HHS-US Department of Health and Human Services SHARES sta-
- tion, sounding in ALE, at 1251. (Privat-France)
 17982.0 Aircraft 511-Brazilian Air Force, calling Navy submarine Tamoic
- 17982.0 Aircraft 511-Brazilian Air Force, calling Navy submarine *Tamoio* in Portuguese, no joy, at 2034. (Perron-MD)
- 18183.4 7RQ20-Algerian MFA, Algiers, with a Coq-8 New Year's greeting to all-stations, at 1600. (Hall-RSA)
 18571.7 Unid-Tunisian diplomatic messages in 5-letter code groups, usual
- powerful FEC signal, at 0949. (Hall-RSA)

 18666.0 OC1-US Federal Bureau of Investigation. Oklahoma City. calling
- 18666.0 OC1-US Federal Bureau of Investigation, Oklahoma City, calling EP1 (El Paso, TX), in ALE at 2211. (Perron-MD)
 19320.0 OLZ88-Czech MFA. Prague. weird ALE-initiated CW and data
- 19320.0 OLZ88-Czech MFA, Prague, weird ALE-initiated CW and data exchange with OLZ78, at 1234. (Watson-UK)
 19323.0 OLZ-Czech MFA, Prague, hourly ALE calls to OLZ78, starting at
- 1142. (Watson-UK) 19709.0 ERMSAL-Brazilian Navy, Salvador de Bahia, calling several ships
- 19709.0 ERMSAL-Brazilian Navy, Salvador de Bahia, calling several ships in ALE at 1156. (Privat-France)
- 19814.0 022NHQCAP-US Civil Air Patrol National Operations Center, AL, ALE sounding at 2327. (Perron-MD)
- 20945.5 8BY-French Forces, Paris, weird CW markers at 1450. (Perron-MD) [ENIGMA code M16 was withdrawn 8BY isn't really "numbers." Hugh]
- 20948.0 8BY-French Forces, Paris, CW marker at 1255. (Perron-MD)
- 20992.5 Tahoe 81-US Air Force, patches via MARS AFA1RE (ME) and AFA2MH (GA), at 2039. (Cleary-SC)
- 22401.0 UIW-Kaliningrad Radio, Russia, Marine Information Bulletins and holiday traffic in transliterated Russian SITOR-B, at 1409. (Perron-MD)
- 22542.0 JJC-Tokýo Radio, Japan, with very clear Japanese newspaper FAX from Kyodo News, simulcast on 8457.5, 12745.5, 16971.0, and 17069.5, at 1600. (Hall-RSA)
- 23337.0 538032-US Air Force KC-135 63-8032, ALE sounding at 1506. (Privat-France)



Digital Digest

Mike Chace

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Listening Tips, CAP, and Brazilian ALE

s promised last month, we thought we'd start this month's column with some tips for finding utility stations. We also provide an update on the US Civil Air Patrol and Brazilian Navy and their use of Automatic Link Establishment (ALE).

Listening Tips

Rarely does a month go by without an e-mail from a new listener asking us how we "hear" digital utility stations. If we leave aside the obvious need for a good radio (which we covered in last month's column) and a decoder, we are blessed with the same basic equipment that any other listener has, namely two ears and a brain!

As part of answering this question, we've also urged listeners, new and old, to check into Leif Dehio's excellent *Digital Signals* website and listen to the audio clips of practically any digital signal on the air today. Being able to recognize various systems from their characteristic sounds is a vital skill also.

But what else can we do to increase our chances of hearing some good digital DX?

Tuning Ranges

Before we turn to some techniques to increase the likelihood of catching those elusive signals, let's review the most fruitful regions of the dial for digital utility stations. For years, we've searched the following basic frequency ranges in order to find the bulk of interesting diplomatic, military and commercial digital traffic:

Daytime	Nighttime
13300 to 13600	4000 to 4100
13850 to 14000	4400 to 5850
14350 to 15000	6600 to 7000
15700 to 16400	7500 to 8200
17400 to 17550	8800 to 9350
17900 to 21000	9900 to 11450
21500 to 26000	12000 to 12400

As you will probably notice, these ranges – wherever you may be in the world – will basically keep you in the so-called "Fixed" station allocation. In other words, we are keeping away from broadcast, maritime and aeronautical traffic.

Why? Well, most of the stations that we are searching for have relatively low transmit power and modest antenna systems. They simply can't complete with the many kilowatts and huge antenna farms of these permanent stations and so will keep away. However, some stations also use this very fact to *decrease* the chances of being heard by the likes of us!

Tuning Techniques

So, now we know roughly where on the dial we need to be to hear our stations of choice. How do we continue to refine our search techniques to maximize our chances of hearing some interesting stations?

First, if our receiver is capable of searching, why not use the receiver to do the hard work? We often set our radio here to start searching from 20000 kHz and simply stop the search when the radio sweeps past something of interest. For this technique to work well, however, requires the radio to be set at a relatively slow sweep rate of a few hundred Hertz per second and, of course, it must be able to search with the squelch control open (if it has one), remembering that the majority of our stations won't be big signals capable of breaking even a modestly set squelch.

Our second technique, a variation of the simple sweep or search above, is to nominate a couple of 100 kHz ranges on which to concentrate each day or each hour. The range can be searched repeatedly manually, or if your receiver has a frequency-to-frequency repeating search (often called something like "Programmable Band Scan"), we can again let the radio do the work.

This technique works well because of two main reasons. First, it increases the chances that you will find brief transmissions, since you cover the same ground in relatively short intervals. Remember that digital signals come in two main varieties – continuous signals (like RTTY, SITOR-B, ARQ-E3, etc) and burst signals (SITOR-A, PacTOR, MIL-188-110A, etc). A burst station with long gaps between bursts may not be heard during the first sweep-through of your chosen chunk of spectrum, but subsequent sweeps may catch it. Continuous signals will always be caught, of course.

Secondly, you will quickly become familiar with the usual occupants of your chosen piece of spectrum. This latter point is extremely important, as learning the habits and regular occupants of a certain section of spectrum is a vital part of knowing where to focus your listening time.

Try these techniques next time you listen and see what more they can tell you about who is on, at what time, and where.

◆ US Civil Air Patrol (CAP)

Most *MT* readers will be familiar with CAP, which has been covered extensively in many other columns over the years. Like most US agencies, CAP also makes of MIL-188-141A ALE in order to provide interconnectivity, frequency selection, and interoperability with other government agencies. Ron Perron recently

checked into their network and we weighed in with a few more frequencies that appear to be new to the system (all frequencies kHz USB).

3068 5006 6800 6806 7602 7739 8012 9047 11402 13415 19814 20107 23006

ALE Identifiers:

062NHQCAP

RIC **CAP National Technology** Center, Richmond VA 004MERCAP UNID 034MERCAP Middle East Region, NC Region Chief of Staff (unconfirmed) 022NHQCAP **National Operations Center** (NOC), Maxwell AFB AL UNID 033NHQCAP 043NHQCAP UNID 046NHQCAP UNID 047NHQCAP **Director of Communications** (DOK), Maxwell AFB AL (un-

confirmed)
Director of Operations
(DOO), Maxwell AFB AL (un-

confirmed)

Any help in piecing together the unidentified parts of the network would be appreciated.

Brazilian Navy Update

Space prevented us from printing this update a few months ago, also provided by Ron Perron, regarding the recent upturn in Brazilian Navy ALE activity which shows that more of their ships appear to have joined the network:

Brazilian Navy Radio Station, Belem **ERMNAT** Brazilian Navy Radio Station, Natal ERMRIO Brazilian Navy Radio Station, Rio de Janeiro FCONST Brazilian Navy Frigate F-42 "Constitucao" (Classe Niterói) **FDEFEN** Brazilian Navy Frigate F-41 "Defensora" FUNIAO Brazilian Navy Frigate F-45 "Uniao" (Classe Niterói) NDDCEA Brazilian Navy G-30 "Ceara" (Navios de Desembarque-Doca) **NEBRSL** Brazilian Navy U-27 "Brasil" (Navio-Escola)

Ron also reports activity on the following frequencies:

8031 9117 11010 11452 11455 11486 12132 12370 14705 14780 15932 kHz USB

Until next month, enjoy your digital listening.

Resources

Civil Air Patrol Brazilian Navy http://www.cap.gov http://www.mar.mil.br



Shortwave Broadcasting

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Precision Frequency Measurement

A few DX listeners dare to report kHz frequencies to three decimal places. Some old-fashioned editors don't even want frequencies with any decimal places, rounding off any that they get, but precision frequency measurement is one more tool to help identify stations, if you know what you're doing. One thing *not* to do: don't rely on your digital readout, especially if you tune to one side to avoid interference. Only true carrier frequencies should be reported; this may require measuring them with the BFO on.

We asked one practitioner of PFM, Stig Adolfsson in Sweden, via Thomas Nilsson, *Shortwave Bulletin*, how he does it?

Glenn, Thanks for your interest in the way I am carrying out frequency measurements. I am using a Rohde & Schwarz frequency standard with an accompanying receiver which is phase-locked to the DCF 77 Mainflingen LF transmitter. This set has an accuracy of 0.00001

Hertz at 10 MHz. The measured frequency is given directly digitally with four decimals, e.g. 21600.0001 kHz. The received carrier is shown on a CRT as a Lissajous figure or rotating marker so you know for sure when you are tuned correctly.

Very often you see people give two decimals on the monitored frequency when presenting their loggings. These stated frequencies are not always correct. Without visual aids, it is almost impossible to tune in exactly on the AM carrier. Then you have other factors influencing the reception, like filter symmetry, strong interfering signals, accuracy of the receiver internal frequency reference. Another factor of importance is the fact that most modern receivers are designed for SSB reception, which mean they suppress the AM carrier, so a LF response below 100 Hz is rarely found. So telling the true received frequency is a tricky matter.

ALASKA You will find no US HFBC stations in 40/41 meters below 7300 kHz. It is only in ITU Region 2 (the Americas) that hams have 7100-7300 kHz portion of the spectrum (Dan Ferguson, IBB, swl at qth.net) A station is operating in violation of this long-standing policy. KNLS, in Chinese at 1000 on 7160 ex 7365 (Robin VK7RH Harwood, Tasmania) Perhaps they decided, "close enough" to Asian region, and not many Alaskan 40m hams would be wanting to use 7160 in the middle of the night at 1 a.m.! But the hams would surely be justified in "jamming it to hell" as they have "exclusive" right to it!

as they have "exclusive" right to it!

Original version of the January schedule had the 1000 Mandarin on 5955, ever used? But soon changed to show 7160. One might guess they had again hired airtime in the DVR, where this is legal, but no mention of that, and this fits right into the rest of the KNLS schedule before 1000 and after 1100. Not for long, tho; the February schedule moved this to 9615. KLNS must expect to have loyal listeners to keep up with frequency changes every month (Glenn Hauser, DX Listening Direct)

ANDAMAN & NICOBAR ISLANDS AIR Port Blair had been reduced to 4 kW, but resumed 10 kW in mid-Jan. Schedule is: 4760 kHz 2355-0300 UTC, 1030-1630/1700/1730; 7115 0315-0346 (Sat 0415, Sun 0505), 0700-0930. Note: 4760 is also used by AIR Leh, both in the mornings and evenings!

Port Blair reports go to Mr. K. S. Venkateswarlu, Station Engineer at ks_venkateswarlu@hotmail.com While sending reports to any AIR station, please write the date and time in Indian Standard Time [UT +5.5]. Instead of SINPO reports in numbers, briefly explain reception quality in words. The Spectrum Management & Synergy Division of All India Radio HQ in New Delhi have created a separate account to receive reception reports from listeners. It is: spectrummanager@air.org.in (Jose Jacob, VU2JOS, dx_india)

ARGENTINA RAE (Radio Argentina al Exterior) is very hospitable to visitors: on the radioescutas list, Antônio Schuler from Recife told of his visit to Buenos Aires, where he was warmly received by RAE manager Marcela Campos, a day he will never forget. Rudolf Grimm from Porto Alegre agreed that his own visit was unforgettable (gh)

BOLIVIA In mid-December, a new Bolivian was heard by Björn Malm, Ecuador, SWB América Latina on 4722.86 at 0000-0200*, not on the air every day. Henrik Klemetz, Sweden, identified it from a recording as Radio Uncia in the town of the same name, 105.3 and testing SW on "4700". Then it was heard by Dave Valko, PA, Cumbre DX at 2312-0100+ with romantic LAm pop music, very low distorted modulation. Klemetz found out more about it: owned by the Municipality of Uncia, 15 minutes away from Llallagua, the place where the tin tycoon

Simón I. Patiño used to live. In his day he was one of the wealthiest men on earth. His mansion has now become a museum. But by January 1, R. Uncía was no longer being heard, says Bob Wilkner, FL, Cumbre DX.

CANADA Beware of mixing products between any two RCI Sackville frequencies, many of which relay other stations. The formula is 2B minus A, where you will hear the audio of one or both. These keep popping up above 6.2 MHz, for example. If you hear one, scan inside the band for matching audios, and do the math. But there's another formula, B minus A (gh) Sackville transmitter mixing product found on 3530 at 1100-1200: Radio Korea relay on 9650 minus Radio Japan on 6120 (Steve Lare, MI, swl at qth.net)

CHINA CRI Plans Expansion On Radio And Internet. Replying to a Bangladesh listener, the "Listeners' Garden" program said CRI is adding more English broadcasts so listeners in different target areas can hear it both in morning and evening, and will soon run continuously on the internet. CRI is already advertising for a news editor for the 24-hour service – see http://www.crienglish.com/job.htm And is recruiting monitors for 2004-2005. They are expected to report not only on technical quality but on programming and even to organize CRI events in their locality.

I think CRI has deliberately set out to rival the big Western stations in both quantity and quality. Journalistically it has a long way to go. News is frequently many hours behind reporting on other stations, due in part, to being pre-recorded, a cardinal sin for news. If China can find an effective journalistic voice to convey its policies and concerns to an international audience, then that is to be welcomed. CRI is becoming increasingly adept at communicating with the world (Roger Tidy, UK, DXLD)

Domestic network CNR-1 has been renamed Zhongguo zhi Sheng (=Voice of China), heard at 0800 on 17615, 15370, 11750, 11720 (Olle Alm, Sweden, DXLD)

New 2004 schedule of China Huayi Broadcasting Company: 2230-0000 and 1300-1700 4830; 0000-1300 6185, except 0400-0830 ceases broadcasting for transmitter checking every Wednesday. (Qiao Xiaoli, Cumbre DX)

COSTA RICA RFPI served as a defacto American public radio station broadcasting on shortwave to the United States. It didn't perform that mission very well. Existing American shortwave stations could have carried it out much better, where the going rate is often \$30 for an hour of airtime on a 50 kW transmitter. With an Internet stream of its programs, it could be on shortwave now, instead of a year from now. This makes a lot more sense than setting up shop again in Costa Rica (Hans Johnson, radiointel.com)

Potential advantages in this approach: better reception, larger audience, improved diversity of programming on US stations, more cost effective, greater listener support (John Figliozzi, NY, swprograms) I am sure that several NASB members would be more than happy

to sell RFPI airtime at very reasonable prices. I'm sure there are some that would not accept certain types of programs that were on RFPI (just as they don't accept certain rightwing programs), but that is their prerogative, and there would still be more than enough stations to accommodate RFPI's needs. In addition to lower start-up and op-

All times UTC; All frequencies kHz; * before $hr = sign\ on$, * after $hr = sign\ off$; $// = parallel\ programming$;

+= continuing but not monitored; 2x freq = 2nd harmonic; B-03=winter season; [non] = Broadcast to or for the listed country, but not necessarily originating there; u.o.s. = un-less otherwise stated

erating costs, it's a lot less hassle and administrative work, and it provides the time-buyer with the greatest amount of flexibility (Jeff White, WRMI, NASB) Except being in full control of your own station (ab)

TIUCR, R. Universidad de Costa Rica, presumed the one on 6105.01, at midday, 1630-1730+ UT with continuous classical/chamber music, rather low modulation (David E. Crawford, Titusville, FL, Cumbredx) 0035 blues, 0056 ID, 0102 chamber/opera vocals (Terry Krueger, FL, Tocobaga DX) Also at 0445-0532 Latin music (Rich D'Angelo, PA, NASWA Flashsheet) And 1115 light romantic vocals, 1200 no ID, not much left by 1230 (Jerry Berg, MA, ibid.) Web site http://cariari.ucr.ac.cr/~radioucr/radioucr/ has little detail, no mention of SW but tho cultural they do have a rate card (gh)

CUBA Ms. Dora Guillén, creator and one of the presenters of the Guaraní language section of Radio Havana Cuba passed away suddenly December 9, 2003 in Asunción, Paraguay. Funeral took place at the Paraguayan Communist Party headquarters. Guillén was a member of the PCP's Central Committee. Guillén lived her last 41 years in Havana. In 1962 she went to RHC, launching the program in Guaraní, the native language spoken in Paraguay. There is a sense of emptiness in Radio Havana. The upset voice of her inseparable comrade, María Céspedes, sent to the ether the last farewell (Miguel H. López, Última Hora, Paraguay, via Horacio Nigro, DXLD)

[non] During VOA's Ventana a Cuba program at 0100-0200, some R. Martí frequencies such as 11775 and 13820 temporarily lose their bubbles, as the Cuban jammers shift to the VOA frequencies (Adán González, Venezuela, DXLD)

GERMANY The VOA/Radio Liberty/Radio Free Iraq relay site at Holzkirchen closed December 31, after a long campaign by local residents in Valley the Oberlaindern to get rid of all the RF. Station grounds will be sold for 7 million Euro to the municipality. It is intended to establish a golf course there. The federal government of Germany will pay the expenses of 600,000 Euro for the demolition of the station. All transmission equipment will be dismantled by the end of June 2004; three of the four shortwave transmitters will be moved to the Philippines, but what about the other one? Almost all the transmissions were moved to other sites: Lampertheim and Biblis, Germany; Kavala, Greece; Briech, Morocco (Kai Ludwig, DXLD)

GUAM KSDA Chief Engineer Dan Weston agreed to my visiting the station.

I witnessed three or four new 100 kW ABB transmitters in operation, and another one was being serviced, soon to come on line. They still have a studio room, but due to RF feedback, programming now comes from CDs or from studios somewhere else. Transmitters are cooled with special non-conductive water. An engineer vacuums dust away from the transformers. I saw an exciter tube about two feet in length and a foot wide. There were special boxes between cabinets to cut back on RF between the units. Just being there was like a QSL card in itself (Larry Fields, N6HPX/DU1, swl at qth.net) see SAIPAN

IRAN V. of Justice, in English at 0130-0227 confirmed on 6120 and 9580, also scheduled on 6135, 9835; at 1130-1157 heard on 15550, 21470, 21730, but irregular (Observer, Bulgaria)

IRELAND Glenn, it is with great sadness and anger I learn of the termination of RTE's shortwave transmissions as of Jan. 1 2004. I smelt a rat when the "consultation exercise" occurred shortly before Christmas when many exiles were returning to Ireland to spend Christmas with their families and the response announced within a couple of days including free World Space Radios for African listeners – how could that have been decided in such a short period? When was Merlin informed? For a country of 4 million with 70 million people of Irish heritage around the world short wave radio was ideal. For those like me that have returned to Ireland but travel regularly it is easier to bring a shortwave radio with me rather than a satellite system to keep in touch with home! I did not come across any reports of these developments in the Irish written media.

Those of you who wish to register your protest, please send them to Lennie.Kaye@rte.ie or Lennie Kaye, RTE Radio, Donnybrook, Dublin 4, Ireland. As RTE is 100% [state] owned, perhaps letters of protest to your local Irish Embassy or Consulate would also be helpful! It is a very sad day for the many Irish and friends of Ireland that listened to RTE on shortwave! (Paul Guckian, Ireland, DXLD)

IRELAND [and NORTHERN?] Irish church stations heard on CB: With the help of Roger [Caird, Ireland], a compilation of the transmissions from Irish churches heard during the past 2 years. [26805-27981.25 kHz]: http://www.wunclub.com/wunstr/wunstr0309.html (via Jem Cullen, Australia, ripple)

ISRAEL Contrary to expectations, Israel Radio did not cancel most of its SW languages at yearend, tho schedule somewhat modified. Still in Hungarian, Romanian, Spanish, Ladino, Yiddish, Persian, Russian, French, Arabic, Hebrew. And English, to NAm/WEu u.o.s.: 0500-0515 7545 6280, CAM/Au 17600; 1110-1120 15640 17535; 1800-1815 15640 11585; 2000-2025 6280 11585, SAf 15640. Per sked from Moshe Oren, Bezeq, via Doni Rosenzweig. Observer, Bulgaria had different info for 1800-1815: 9435 and 17535.

The Hillel transmitter site closed down two MW transmitters and the old 100 kW SW used on 11585, retaining only a 500 kW Telefunken (Daniel Rosenzweig, DXLD)

LIBERIA The High Adventure transmitter moved here from Southern Lebanon is up at half power of 5 kW. An engineering crew was going there in late January to tune the transmitter, on 11515 (Morgan Freeman, WJIE, DXLD) Last reported off the air in July, 2003, ID as V. of Liberty (gh)

MYANMAR I have been hearing a station on 5770 in Burmese at 1330-1630 and again from 0130. Victor Goonetilleke of Sri Lanka says it is the Burmese Defense Ministry which was on 6570 earlier and was off the air for some time (Jose Jacob, India, World of Radio)

NIGERIA Fun stuff on V. of Nigeria, Tuesday at 2140 on 17800: a quiz contest with questions about various political, historical, landmark factoids across the continent, and the question numbering was also curious – not in consecutive order, and changing with each round. In between rounds, VON solicited donations to support the contest, giving its own mailing address. Questions ran the gamut along the lines of: what year did some African country get its independence; what is the correct form of the title of the head of state of some country; #19 in the "second" round was – who was the first woman to drive a car in Nigeria; what is the tallest building in Nigeria; what does a given set of initials stand for and when was it founded under what leader; etc. The winner was declared at 2156, the emcee said "bye for now" and said his name was Oliver something, then was followed by a delightful piece on the fingerpiano. A YL gave an ID and launched into news. And a good time was had by all including this listener (Clara Listensprechen, shortwave basics yahoogroup)

NORWAY R. Norway and R. Denmark are gone from SW after Dec. 31.

Now the transmitters are closed but still powered in a mode dubbed "black heating". This way they can be kept operational without further maintenance for some time (contrary to a complete shut-down that would result in the transmitters becoming unusable) in case some-body should be interested in leasing a sufficient amount of airtime or if somebody should be interested in obtaining the transmitters for use at other sites – The staff at Kvitsøy and Sveio will be reduced from 13 to 5 until February (Bernt Erfjord, Norway, via Kai Ludwig)

PAKISTAN On 5080.3, R. Pakistan, Islamabad, at 1635-1650, English current affairs program with reports on Afghanistan and Taliban (Vaclav Korinek, RSA, DSWCI DX Window) WRTH 2004 says the News & Current Affairs program on SW is scheduled: 0200-0400 on 6205, 1300-1800 on 5080, both 100 kW Islamabad, in Urdu and English. Specific times for English not specified; can anyone find out? (gh)

POLAND [non] Announcements on Radio Maryja said it would leave short-wave as of January 1 (Wojtek Zaremba, Legionowo, Poland, World of Radio) Was via Russia. Final SW broadcast did not inform listeners how to continue listening on internet, domestic radio (Kai Ludwig, Germany)

ROMANIÁ RRI program quality is variable. Some of their announcers read in a rushed and mechanical manner as if they were not concentrating on what they are saying, and often it's difficult to determine where one sentence ends and the next begins! But there are others who are much better, and overall I get the impression that this station, for all its faults, is trying hard to provide a decent service for its listeners. Probably the best show is Sunday Studio aired every week during the 56-minute periods, one of three shows in which RRI answers listeners' mail. The other two are Listeners' Letterbox (Thursdays) and DX Mailbag on Saturdays. English schedule:

WEu: 0700-0726 on 11775 and 15105; 1300-1356 on 15105 and 17745; 1730-1756 on 9570 and 11940; 2030-2100 on 6110 and 7105; and 2200-2256 on 5975 and 7250.

ENAm: 2200-2256 on 9550 and 11830 and 0100-0156 on 9510 and 11740.

WNAm: 0100-0156 on 6040 and 9530 and 0300-0356 on 6040 and 9515.

Au: 2300-2356 on 11840, 11940, 15145 and 15370 (Roger Tidy, UK, DXLD)

RUSSIA [non] Voice of Russia is relayed by SW transmitters abroad in Armenia, Moldova, Tajikistan, Ukraine, China, Germany, and Vatican. Vatican City State: 7350 0300-0500 250 kW, 9765 0200-0300 250 kW (Nikolai Rudnev, Belgorodskaya oblast, RUS-DX) Most or all in English to NAm, providing some of the best VOR reception here (gh)

SAIPAN Having visited KSDA Guam on Christmas, I went ashore here on New Year's, to visit FEBC (KFBS) for the second time. It's about 20 minutes from the main part of town, and found it quite fast, as the antenna towers were visible from the main part of town. I could also see 'em at night as they have a fancy way of lighting 'em up at night; they form a glow across the lines and reflect like a giant Christmas light

It's about 6 minutes off the highway down an old rock path. The antennas are like those of AWR, and KTWR, but shorter and four towers instead of six. An engineer took me into one building where they had about five studios and audio room where they still have at least a thousand cassette tapes from years of programs. The tapes are no longer being used and they are starting to go the same format as AWR and KTWR with audio CD. They have a few students in the process of changing the audio cassettes to CD or digital. The rooms where they did the programs are all still there but some are being used for storage. The engineer took me into the transmitter room; they now

Shortwave Broadcasting

have three transmitters instead of four. The fourth transmitter is now in their FEBC station in the Philippines and they might be getting a new one.

We went out into the yard where the antennas were and actually walked over between the towers. We talked about the damages they get and the way they repair the antennas. They just lower the curtains to work on damaged cables or wires. They also do this when the typhoons come through. These are multiband dipoles. It takes all day to put 'em back into the air. They start at 5 am and work till 6 or 8 in the evening.

Then I was planning to visit Radio Free Asia [IBB, ex-KYOI] which is about ten minutes from the other side of the town area. I found the antenna farm. A lot different in design and shape as compared to FEBC and the others at Guam. They were still curtains but the towers were not the same make. They also had two big satellite dishes outside and some smaller microwave types to talk to another station only a few miles away. I took a number of pictures outside. And drove up the gate where they had a security guard standing by. I asked if there was a chance to see the station. The reply was a big disappointment. Since they just raised the terrorists level in the states, it came here as well.

The answer was a flat out NO! I found out also that right across the water within range is the Voice of America transmitter station on Tinian island and I could see it pretty clear but I think it too would have been out of bounds. I ended up getting stuck out in town over night and really enjoyed myself on this neat little island (Larry Fields, N6HPX/DU1, swl at qth.net)

SUDAN [non] Sudan Radio Service (heard via Javoradio Oz) at 1501 on 15530 announced schedule as 1500-1700 on 15530, and new 0300-0500 on 9625 (Hans Johnson, FL, Cumbredx) Bad news for CBC Northern; site is UK

UGANDA Radio Uganda Loses Part Of [Shortwave] Transmission Site In Property Deal. The department of information has lost another prime piece of land in Bugolobi to a private developer in a mysterious deal reportedly sanctioned by the former state minister for information, the late Basoga Nsadhu.

The land on Plot 4 and 5 Faraday Road was meant to be left open as a security measure for the Radio Uganda Short Wave transmitters in the Middle East [sic], but has been given to an unidentified developer who is already erecting a perimeter fence.

The land originally measuring 23 acres also had huge swathes fenced off from the southern end approachable from Bazarabusa Drive. At some spots, the fences are as close as 20 metres from the transmitters.

Information minister Nsaba Buturo said his predecessor erred by giving out the ministry's land in Bugolobi. Buturo warned that the area was dangerous for human habitation because of the radiation from the installations. "I am writing a letter warning those people about the risks. It has never been done anywhere in the world that people settle close to such installations. The radiation from the equipment poses a big health risk," he said.

The Bugolobi mast hosts antennae for short wave transmitters to the east, west and northern parts as well as for Kenya, Tanzania, Rwanda, Burundi, Zambia and Zimbabwe, a ministry official said. [4976, 5026?]

"The installations on Naguru hill are very sensitive and need good aeration. But the area is now surrounded by high wall fenced buildings and our equipment are not getting good ventilation which is likely to affect its lifespan," an official said (The New Vision, Kampala via AllAfrica.com via Kim Elliott, Artie Bigley, Jilly Dybka)

- U K A sad but inspiring story Jonathan Marks came across a story from last August in The Times which most of us seem to have missed. Apparently former BBC World Service announcer John Stone suffered a massive stroke three years ago. The story is about how John has coped with the situation. And, like all of us, he never imagined such a thing could happen to him (Andy Sennit, Media Network blog) Stroke: 'I Can Think, But I Can't Bloody Say It' Health features August 27, 2003, By Susan Shepherd http://www.timesonline.co.uk/article/0,,8123-892676,00.html (via Andy Sennitt)
- U S A You might think VOA is entirely tax-supported, as is only appropriate for the US government broadcaster. But, perhaps due to budget cuts, VOA is now heard with commercial underwriting credits, just like public radio! Catching our ear at 0529 UT Mon on 6035, and when rechecked 24 and 48 hours later, during a 2-minute break when affiliates may sell real commercials, VOA has a brief sesquiminute feature Our Ocean World, apparently an in-house production (if it's worth producing and broadcasting, why isn't it on the program schedules??) concluding with: "made possible by Royal Caribbean International and Explorer of the Seas, http://www.royalcaribbean.com" No doubt this also occurs at many other times now on VOA. Other listeners please note and report times and details (Glenn Hauser, OK, World of Radio)

Veronique Rodman, a public relations specialist and former television producer, has been appointed to the Broadcasting Board of Governors (BBG), the bipartisan, nine-member board which super-

vises all U.S. nonmilitary international broadcasting. President Bush nominated Rodman to the BBG on October 24, 2003, and gave her a recess appointment on Dec. 26, 2003. Rodman is director of public affairs at the American Enterprise Institute for Public Policy Research, a Washington-based think-tank. Before joining AEI in 1999, Rodman worked for many years in broadcasting. From 1982 to 1995, she served as a producer of ABC-TV's This Week With David Brinkley. As a television news consultant, she later helped launch Fox News Sunday. Rodman also worked as vice president for the Cosmetic, Toiletries and Fragrance Association Foundation (BBG press release)

[non] Dave Barasoain is no longer the Wavescan host. He has left AWR due to budget cuts (Jeff White, WRMI) Tsk; he lent it some class. I listened to parts of the Jan 4 AWR Wavescan 470 online, and head that the "all-new" Wavescan is hosted by Piper Anna Shields, or something like that, and by Ray Allen (sp?); another announcer reading a segment was Ariel McCleghan (sp?). As John Norfolk notes, some links to the scripts lead nowhere, but the scripts don't usually mention the names of the announcers, anyway. In the 28th minute of the previous edition 469, Dave Barasoain briefly said his goodbye, "leaving WS and the AWR family for different horizons in the new year," after 12 years of employment there (Glenn Hauser, DXLD)

On 1 January 2004, Adventist World Radio sharply reduced its international output, mostly by canceling morning transmissions and second frequencies. While the overall output of AWR's own short wave station KSDA was cut by some three and a half transmitter hours reducing transmissions to single frequencies, Merlin Communications and T-Systems lost more than 20 hours of leased airtime daily: Al Dhabbaya eight hours, Meyerton four hours daily, Moosbrunn five hours daily, Jülich three hours, Taiwan one hour. Broadcasts in Malagasy via the Radio Netherlands station on Madagascar and in Spanish via Radio Netherlands in Bonaire remained unchanged (Dr. Hansjörg Biener, Nürnberg, Germany, http://www.biener-media.de via dx_india)

[non] On Xmas Eve heard Brother Stair himself announcing a huge frequency list – 'unprecedented' as he calls it. He also asks for \$100,000. Some unpaid bills? The Overcomer Ministry's website shows a remarkable amount of output via Jülich, including nine frequencies at 1000-1100: 11950, 17482 [sic], 15235, 17735, 6100, 9610, 13820, 9485, 21720; and no less than eleven for 2200-2300! – 6175, 9695, 9490, 5985, 9730, 9480, 7105, 5905, 6055, 6045, 7145, in addition to some other broadcasts (Silvain Domen, Belgium, World of Radio) He's probably getting a discount deal like on some US stations, occupying otherwise unsold time until they can sell it to somebody else for full price. Says this schedule is for five months only; then the apocalypse?? (gh)

Religion for Adults: A program called The Secular Bible Study airs weekly on WBCQ. The host presents a balanced and insightful discussion of the interpretation of biblical works from a scholarly viewpoint. He examines biblical stories from the historical and cultural perspective and cites many sources. The show is consistently well produced and always very interesting. The host makes it a point to state that it's not a "religious" show and that no requests for donations will be made. The Secular Bible Study runs on WBCQ 7415 from 9 to 10 ET (Tuesday 0200-0300 UT). (Larry Will, Maryland, DXLD)

The guy running this show is not afraid to say that certain books of the bible are just outright fiction. It's an hour long program with the first half devoted to the old testament and second part to the new testament. He reads the bible verse by verse, word by word, using at least twenty sources. He reads a verse from the King James, then explains how the other versions differ on a word or phrase and then pronounces sentence as to whether or not there's any truth to it. In the short time I've listened to it I've heard him proclaim that the Book of Exodus is total fiction, the story of Abraham is total fiction, the gospels weren't written by the apostles and a few other gems (John H. Carver Jr., IN, DXLD)

WBCQ is very interested in trying out DRM, probably on 9330, once all the equipment can be installed, but we have no intention of giving up analog (Allan Weiner, WBCQ, DXLD) Came across this website http://www.rfma.net/ – a forum discussing things like what's on WBCQ's internet stream and what's not – like Hal Turner; rants, kooks, KIPM. etc. (ah)

Additional times for World of Radio: WBCQ, UT Sun 0130 on 9330-CLSB; WWCR, Sat 2130 on 12160; all one hour earlier from first Sunday in April (gh)

WWRB is adding a 3 MHz frequency, 3200, 3220, or 3225. Our fiberglass radome is ready we will begin construction of our VOR on 108.00 MHz, experimenting with new antenna designs. We have a complete avionics repair station right here at the WWRB transmitter site, totally enclosed in an RF tight screen room allowing us to be able to repair avionics while WWRB is transmitting. Our Aircraft Enroute Communications Business is much more profitable than broadcasting, with much less headaches! Getting paid in the broadcasting business is always a challenge (Dave Frantz, WWRB, World of Radio)

Until the Next, Best of DX and 73 de Glenn!

Global Forum

Broadcast Logs

Gayle Van Horn

gaylevanhorn@monitoringtimes.com

0000 UTC on 4775

PERU: Radio Tarma. Spanish. Complete ID with frequency quote and city. SINPO 24332. Peruvians audible: Radio Sicuani 4826.4, 2322-2335; Radio Cultural 4955, 2304+; Radio Santa Monica 4965, 2327+; Radio Quillabamba 5025, 2255+; Radio Los Andes 5030, 2336+; Radio Cusco 6193.25, 0000+. (Arnaldo Slaen, Buenos Aires, ARG) Radio Nor Andina 4460-7, 1041-1058. (Scott Barbour, Intervale, NH)

0000 UTC on 7270

ALBANIA: Radio Tirana. Poor signal quality during station ID, frequency quote and national news. (William McGuire, Cheverly, MD)

0027 UTC on 6150

SINGAPORE: Radio Singapore Intl. News coverage on the Philippines to "RSI" identification. 7235, 1137-1150. // 9665 poor copy; 6150, 1154-1202. (Barbour, NH) **BBC Singapore** relay 9740, 0027. (Stewart MacKenzie, Huntington Beach, CA)

0122 UTC on 6120

IRAN: Voice of Justice. Anti British commentary on Iraq, to "this is the Voice of Justice from the Islamic Republic of Iran," SIO 332. (Harold Frodge, Midland, MI)

0200 UTC on 9870

RWANDA: Deutsche Welle relay. German service's interval signal, identification and report on Iraq. (McGuire, MD) 9655, 0034 // 13780. English 9545, 0413; 17860 //13780, 11955 at 2316. (MacKenzie, CA) **Radio Rwanda** 6055, 1917-2007 Vernacular/ French with Afro pops, to two solid Ids. (Barbour, NH)

0300 UTC on 9400

BULGARIA: Radio. Sign-on interval signal, ID and national news report on European Union. (McGuire, MD).

0320 UTC on 4830

VENEZUELA: Radio Tachira. Spanish chat to two English IDs including call letters "YVOB." Two anthems to 0357*. (Rich D'Angelo, PA/NASWA Flash Sheet) Radio Amazonas 4939.7, 0308-0314. (Frodge, MI)

0345 UTC on 4775

SWAZILAND: TWR. Religious text to closing ID and music box interval signal at 0355. Opening ID at 0400 into German sermon. (D'Angelo, PA)

0355 UTC on 9885

BOTSWANA: VOA relay. Interviews to ID and VOA News promo, // 9775, 7415. **VOA Sao Tome** relay 11975, 2158. (MacKenzie, CA)

0405 UTC on 6200

CZECH REP.: Segment on national Jewish landmarks. (David Weronka, Benson, NC) 11615, 1636-1645+ on various national concerns of drug abuse and child slavery. (Frodge, MI)

0419 UTC on 11765

SOUTH AFRICA: BBC Meyerton relay. Discussion on Czech and Slovak republics. **BBC Seychelles** relay 9630 at 2030 with Newshour segment. (David Ross, Hamilton, Ontario, Canada) 9630, 1936-1945+. (Frodge, MI)

0857 UTC on 4990

SURINAM: Radio Apintie. Dutch. Reactivated station with ID at 0858. Talk segment into religious text and music at 0900. A treat to hear Dutch from South America again! (Jerry Berg, MA/NASWA) Audible 2230-0445. (George Maroti, NY/NASWA)

1027 UTC on 3976

INDONESIA (Kalimantan) RRI Pontianak. Indonesian with clean QRM free signal for two minutes. **RRI Kendari** 4000, 1053-1104; **Voice of Indonesia** 15150, 1958-2018; **RRI Ternate** (Moluccas) presumed 3345, 2156 with choral music (anthem?) to 2159*. Poor copy. (Barbour, NH)

1110 UTC on 3355

PAPUA NEW GUINEA (Papua) Radio Simbu. Ballads and talk to C&W tunes. Possible national anthem at 1159*. Observed later 1135-1140; PNG's audible; **NBC** (Papua) 4890, 1119-1133; **Radio Manus** (Admiralty Island) 3315, 1140-1151. (Barbour, NH)

1345 UTC on 9570

CUBA: China Radio Intl relay. News story covering research and treatment of AIDS in China. (Weronka, NC) **Radio Havana** 9820, 0021. (McKenzie, CA) 6000, 0331. (Frodge, MI)

1404 UTC on 5995

AUSTRALIA: Radio. Station ID to newscast from male announcer // 9590. Fair-good quality. (Ross, CAN) 21740, 2305 //17795, 9660.

(MacKenzie, CA) 6020, 1042-1103+; 9710, 1946-1959* (Frodge, MI) **ABC** 2310, 1016-1030. (Barbour, NH)

1424 UTC on 12080

MADAGSCAR: Radio Netherlands relay. Good signal quality for program preview of coming week. (Ross, CAN) Spanish 9895, 0010 // 15315 via **Bonaire**; 11655, 2135 // 17810, 9590, 0410 via **Bonaire**. (MacKenzie, CA) Fair quality on // 15595. 9845, 0019 via **Bonaire**. (MacKenzie, CA)

1801 UTC on 13605

INDIA: All India Radio. News to identification at 1805. (Frodge, MI; Weronka, NC) 9475, 2337; 10330, 1655. (Jerry Brookman, Kenai, AK) Additional **AIR** freqs monitored as; 7170, 1048-1106; 4990, 1111-1122; 4970, 1139-1149; 4760, 1123-1137; 4895, 1200; 5010, 1212-1226. Tentative log on AIR 4940 via Guwahati at 1200. (Barbour. NH)

2002 UTC on 13855

ICELAND: AFRTS. World Focus Public Radio News to 2005. (Frodge, MI) AFRTS Iceland 6320, 1644. (Brookman, AK) AFRTS Key West site 12133, 1733-1738. (Frodge, MI)

2009 UTC on 11335

NORTH KOREA: Voice of Korea. French news to ID at 2015. English 11335, 2106-2116+ & 2147-2153+. No parallels observed. North Korea's **KCBS** 11679.85, 2315-2323+, SIO 232; Spanish ID at "Voice of Corea" 11735, 0201-0206+. (Frodge, MI)

2020 UTC on 4976

UGANDA: Radio. Vernacular text to Afro pops and talk segments. National news with breaks for clear identification. (Gayle Van Horn, NC)

2031 UTC on 5050

TANZANIA: Radio. Presumed Swahili at tune-in. Fair signal for talks and music. Lady's mention of Radio Tanzania at 2144 with noticeable signal fading amid music bits. Very pleased with this log. (Barbour, NH)

2031 UTC on 11905

UZBEKISTAN: Radio Tashkent. Discussion on the music of Uzbekistan. (Frodge, MI). **Radio Netherlands Uzbekistan** relay 12070 at 1425. (Ross, CAN)

2218 UTC on 4800

CHINA: CPBS, Geermu. Mandarin service with alternating talks over music to fade-out by 2230. (Barbour, NH) **China Radio Intl** 11980, 1243-1249+. (Frodge, MI)

2246 UTC on 4959.9

DOMINICAN REP.: Radio Cima. Spanish tropicales to three IDs. SIO 322; Radio Cristal/Radio Puebla 5009.8, 2312-2330+. (Frodge, MI)

2312 UTC on 4650.3

BOLIVIA: Radio Santa Ana de Yacuma. Spanish ID "en la Radio Santa Ana" to football coverage. Bolivia's **Radio Paititi** 4682.1, 2317+.**Radio Cruz del Sur** 4876.75, 0050-0058 (Slaen, ARG). **Radio Illimani** 4944.9, 2259-2303+. (Frodge, MI)

2321 UTC on 6950 USB

PIRATE: Radio Free Speech. Holiday parody ads to ID, followed by QSL maildrop address. Reception hampered by poor propagation and medium wave signal spurs. (Joe Wood, Gray, TN) **Under Cover Radio** 6925 USB, 0134-0153; **WHYP** 6925, *2306-2349+; **WSDW-Shadow Radio** 6950.05 USB, 0051-0109. (Frodge, MI) Argentine pirate **Radio Bosques** 6153.17, 0316-0330, best in LSB. (Slaen, ARG). South American pirate **Radio Cochiguaz** 6950 LSB, 0149-0203+. (Frodge, MI)

2337 UTC on 4835

MALI: RTV Malienne. French service playing all Spanish tropicales! "Mali" identification at 2248. Poor signal best to monitor in LSB, // 5995 covered by VOA (Morocco relay) in English. (Frodge, MI)

2345 UTC on 13680

CANADA: China Radio Intl relay. Segment on retirement in China, including an interview with a 105 year old man. (MacKenzie, CA) Canada's **CFRX** 6070, 1808-1816+. (Frodge, MI)

Thanks to our contributors – Have you sent in YOUR logs?
Send to Gayle Van Horn, c/o Monitoring Times (or e-mail gaylevanhorn@monitoringtimes.com) Please note: paper strips and cassette recordings will no longer be accepted.
English broadcast unless otherwise noted.



The QSL Report

Gayle Van Horn

gaylevanhorn@monitoringtimes.com

Merci, Danke, Grazie, Obrigado, Thanks... for the QSL!

Did yesterday's mail bring that sought-after reply from a Chinese domestic station? Did RTBF International's French verification letter leave you baffled? If translating Chinese and French have left you

stupefied, as well as a bevy of other languages, I have a solution. Systran Standard, a leading computer software, offers a proven and

cost-effective way to translate emails, letters and web pages. Your own terminology can be added to translate any text. For more product information, go to: http://www.systransoft.com/Products/Standard.html.

Is free your favorite word? Alta Vista's Bable Fish Translation website offers free online translations for words, a block of text or a

web page. Common languages include English, French, German, Spanish, Italian, Portuguese, Russian, Korean, Chinese and Japanese at: http://world.altavista.com/.

The Free Translation website offers the same languages as Alta Vista, plus Dutch and Norwegian. Both free sites are a tremendous boost for DXers translating or composing their letters at: http:// www.freetranslation.com/.

One additional language aid is a multilingual dictionary. Bookstores as well as online sources can provide this great addition to your reference library.

On-line translations plus software and dictionaries can solve those language problems and could improve your return. Now you can thank the station in almost any language!

DOMINICAN REPUBLIC

Radio Amanecer Intl 6025 kHz. Full data verification letter signed by Lic. German Lorenzo-General Manager. Received in six months for a Spanish report. Station address: Apartado 1500, Santo Domingo, Dominican Republic. (Arnaldo Eranmo, Buenos Aires, ARG)

MEDIUM WAVE

KMMZ, 1640 kHz AM. Partial data verification letter signed by Hiram Champlin-Owner. Letter confirms directional antenna pattern aimed 160 degrees and 340 degrees. Received in nine days for an AM report. Station address: 316 E. Willow, Enid, OK 73702. (Patrick Griffith, NONNK, Westminster, CO)

KPOJ, 620 kHz AM. Prepared verification card signed by Michael Birby. Received in four days after an AM follow-up report. Station address: 4949 SW Mac-



adam Avenue, Portland, OR 97201-3912. (Patrick Martin, Seaside, OR) http:// www.super62.com.

KSPN, 710 kHz AM. Full data verification letter signed by Mike Worrall-Asst. Chief Engineer, plus a color coverage map. Received in 30 days for a taped report. The CE was amazed at the excellent signal quality on the tape. Station address: ESPN Radio 710, 3321 S. La Cienga Blvd., Los Angeles, CA 90016. (Martin, OR)

New Zealand, Radio Rhema, 1251 kHz AM. Full data card with illegible signature, with mention of station as 5 KW. Also received a fantastic packet of goodies, which cost \$17 New Zealand dollars to mail, including a large color New Zealand scenic calendar, booklets and more. Received in 31 days for a taped report. Station address: Rhema Broadcasting Group, Inc., Private Bag 92-636, Auckland, New Zealand. (Martin, OR) this is Pat's 110th QSL from New Zealand...he's definitely a pro! - GVH

WDSU, 980 kHz AM. Station returned my reception report with "confirmation" written on it and signed by Al Decker-Owner. Received in nine days for an AM report. Station address: 745 Main, Deadwood, SD 57732. (Griffith, CO)

MONGOLIA

Voice of Mongolia, 12085 kHz. Full data waterfall scenery card unsigned. Two mint Mongolian stamps and a 50 note piece, Chinese form letter and an English program schedule enclosed. Received in 62 days for a taped report, sent to the Chinese section. Station address: C.P.O. 365, Ulaanbaatar 13, Mongolia. (Martin, OR)

PARAGUAY

Radiodifusion America, 7737.1 kHz. Full data email verification from Adan Mur-Technical Advisor, Received in one day for reception from a DXpedition in Chamberlain, Maine. Station noted as 300 watts with plans to increase their output to 2.4 kW. Email address: ramerica@rieder.net.py. (George Maroti, Cumbre DX)

PIRATE

South America, Radio Cochiguaz 6950 kHz USB. Email verification received in three hours for an email pirate report. Email: radiocochiguaz@yahoo.com (Harold Frodge, Midland, MI)

PUERTO RICO

AFRTS/Armed Forces Radio via Roosevelt Roads, Isabella., 6458.5 kHz. Full data verification letter signed by Brooke Armato JO3 (SW)-Broadcast Operations Specialist. Received in 38 days for an English report sent via email Station address: Naval Media Center, NDW Anacostia Annex, 2713 Mitscher Road SW, Washington, DC 20373-5819. http://www.afrts.osd.mil/ (Frank Hillton, Charleston, SC)

SIERRA LEONE

Radio UNAMSIL, 6137.8 kHz. Frequency only verification letter, signed by Shelia Dallas-Station Manager/Executive Producer. Program schedule and souvenir T-shirt enclosed. Received in 89 days for an English report. Very pleased with this package. Station address: Mammy Yoko Hotel, P.O. Box 5, Freetown Sierra Leone. (Rich D'Angelo, PA/ DXLD)

SOUTH AFRICA

South African Radio League, 21560 kHz. Full

data station card signed by Kathy Otto. Received in ten months for an English report. Station address: Private Bag X06, Honeydew 2040, South Africa. (Arnaldo Slaen, Buenos Aires, ARG)

SOUTH KOREA

Radio Korea Intl 13670 kHz. Full data Koryo Dynasty art card unsigned. Received in 85 days for an English report. Station address: Overseas Service, Korean Broadcasting System, Yoido-dong 18, Youngdeungpo-ku, Seoul, Rep. Of Korea. (Tom Banks, Dallas, TX) http://rki.kbs.co.kr/

SWEDEN

Radio Sweden, 17525 kHz. Full data color station card unsigned, plus station brochures. Received in 25 days for an English report and one US dollar. Station address: SE-105 10 Stockholm, Sweden. (Duane Hadley, Bristol, TN) http://www.se/rs/

AFRTS/Armed Forces Radio via Pearl Harbor, HI 10320 kHz. Full data verification letter signed by Brooke Armato JO3 (SW)-Broadcast Operations Specialist. Received in 32 days for an English report. Station address: (see Puerto Rico) (Hillton, SC)

WRMI, 9955 kHz. Full data card signed by Jeff White. Verification for a special Mexican DX Convention. Received in 58 days for an English report. Station address: 175 Fontainbleau Blvd. Suite 1N4, Miami, FL 33172. (Slaen, ARG)

MARCH HOLIDAY QSLING

Guam Discovery Day, 1 March Bulgaria Liberation Day, 3 March Ghana Independence Day, 6 March Lithuania Independence Day (from Soviet Russia), 11 March

Gabon Founding of Democratic Party, 12 March

Mauritius Independence Day, 12 March Ireland St. Patrick's Day, 17 March Aruba Flag Day, 18 March Tunisia Independence Day, 20 March Iran Noruz (New Year's Day) 21 March Namibia Independence Day, 21 March Pakistan Republic Day, 23 March Greece Independence Day, 25 March



Programming Spotlight

John Figliozzi

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Strong Signals

here are they? While shortwave continues to be an important medium for international broadcasting around the world, several international broadcasters have either de-emphasized or entirely discontinued its use to audiences in North America. Even program listeners are finding that they need, under certain circumstances, to adopt some of the mindset of a DXer to be able to hear some big stations that they heard almost effortlessly in the past.

This is certainly true of **Deutsche Welle**'s English Service. With broadcasts on shortwave now targeted only to Africa, Asia and – to a lesser extent – Europe, there's some heavy lifting to do to locate a broadcast that comes in reliably at listenable levels in North America. (The 2100 broadcast to western Africa originating from **DW**'s Kigali, Rwanda, 250kW relay site on 15410 kHz in winter and 15205 and 11865 kHz in summer has been the best bet by far in at least the eastern half of North America.) This is even more the case for those seeking to tune in **Radio France Internationale**, whether in English or in French!

After the unsuccessful campaign to convince the **BBC World Service** that dropping shortwave to North America (and other regions) was unwise, we found that a few frequencies to adjacent areas still worked for us. But, while the signal (primarily on 15190 mornings and 5975 evenings) is better than we thought it might be, it's nowhere near as reliably or robustly heard as it once was. Listening to *Sportsworld* on Saturdays – which incidentally is still not available via the internet due to copyright issues – can be a supremely frustrating experience, for example.

So, where are those signals, strong and true, on the order in which we used to hear them?

Expatriate Services

In the main, they are to be found in the home language services intended principally for expatriates. Where international services in English and other foreign languages have been a demonstrably harder sell for international broadcasters when seeking funding from their sponsors (ie: their parent corporations and, ultimately, their home governments or their agencies), relays of home services and services designed specifically for countrymen and women abroad have been easier to justify – (though not in all cases, as we have found recently with Radio Denmark, Radio Norway and RTE Ireland).

For those who crave a strong and steady shortwave signal with corresponding superior audio fidelity, this is one route to nirvana which remains. Of course, it helps more if the listener is something of a linguist. But even if language is an initial barrier to enjoyment of every aspect of these broadcasts, the music programs remain largely accessible and there's always the chance that one might be inspired to take the effort to learn a new language.

Two stations that still put powerful signals into North America for much of the day are **Deutsche Welle (DW)** in German and **Radio Exterior de España (REE)** in Spanish. Tune these in and you'll experience shortwave at its best technically. They broadcast as follows:

DW Deutsches Programm

1800-0000	17860
2000-2200	17810
2200-0000	11690, 11955
0000-0600	6075, 6100
0000-0200	9655
0200-0400	9870
0200-0600	6145

http://www.dw-world.de/german/0,3367,705-184676,00.html for further info. Some navigating is required; the DW site is somewhat unsuitably arranged for this purpose.

REE en español

0800-1000	21570 (M-F)
1000-1500	17595 (M-F)
1100-1400	15170 (M-F)
1500-1600	17850 (S)
1600-1800	17850 (S/A)
1800-2000	17850
1900-2300	15110
2000-0000	17850 (S/A)
2300-0500	9540
0200-0600	6055, 11880

http://www.rne.es/ree/OndaCorta/p-h-f1.htm#am for program schedule.

www.rne.es/ree/programas.htm for program descriptions.

Religion on Radio Redux

You'll recall that a couple of months back, I lamented the lack of intelligent programs about religion on domestic North American radio. Thanks to Glenn Hauser, who took up the cudgel by reprinting that segment of my January column in his always excellent *DX Listening Digest*, we have these rejoinders and my thanks for the input.

Sergei Sosedkin (IL) points out **CBC Radio**'s *Tapestry*, broadcast domestically on Sunday afternoons and which also used to be broadcast on **RCI** to the U.S. It still goes out on **RCI** to Southeast Asia and China (M 0000) and is available a number of ways via the internet. Its brief is to examine faith as a force in the world. (I should have recalled this one; it's a very good program.)

Sergei also cites a program from Minnesota

Public Radio entitled *Speaking of Faith*. It's fairly new (**PRI** began national distribution in July) and is hosted by journalist and theologian Krista Tippett. *http://www.speakingoffaith.org* says the program "will grapple with common and larger themes of American life – asking how perspectives of faith might offer illumination." At deadline, 53 public radio stations had signed on to carry this weekly program.

Don Moore (IA) recommends *Sound and Spirit*, produced by **WGBH** Boston and broadcast by 110 U.S. public radio stations. *http://www.wgbh.org/wgbh/pages/pri/spirit/* says the program "explores the human spirit through music and ideas...history, myth and spiritual traditions." On the air since 1996, *Sound and Spirit* is produced by anthropologist, writer and broadcaster Ellen Kushner. Bill Moyers calls it "the best program on public radio bar none." (So why haven't I heard it? My local public radio affiliate has never carried it.)

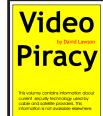
Getting back to shortwave, Larry Will (MD) suggests *The Secular Bible Study* which airs on **WBCQ** (T 0200 on 7415 kHz.) He says this program examines biblical stories from an historical and cultural viewpoint and seeks to interpret biblical works from a scholarly viewpoint.

The hour is split between the Old and New Testaments and, from one listen, it appears to me that the host (whose name I did not get) is not afraid of expressing an opinion. Nonetheless, he does seek to back up his assertions with numerous sources and perspectives which makes for an interesting listen even if your opinions or convictions might differ.

The Comfort Zone Redux

This Australian program also was highlighted in January's column, whereupon **Radio Australia** promptly dropped it from its schedule! It still can be heard via the internet http://www.abc.net.au/rn/czone/ on-demand and on the **ABC Radio National** stream. (It's nice to have alternatives when that happens.)

Until April, good listening!



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① ② ⑤ ③ ④ ⑥ ⑦

Convert your time to UTC.

Broadcast time on ① and time off ② are expressed in Coordinated Universal Time (UTC) — the time at the 0 meridian near Greenwich, England. To translate your local time into UTC, first convert your local time to 24-hour format, then add (during Standard Time) 5, 6, 7 or 8 hours for Eastern, Central, Mountain or Pacific Times, respectively. Eastern, Central, and Pacific Times are already converted to UTC for you at the top of each hour.

Note that all dates, as well as times, are in UTC; for example, a show which might air at 0030 UTC Sunday will be heard on Saturday evening in America (in other words, 7:30 pm Eastern, 6:30 pm Central, etc.).

Find the station you want to hear.

Look at the page which corresponds to the time you will be listening. On the top half of the page English broadcasts are listed by UTC $\underline{\text{time}}$ on $\underline{\mathbf{0}}$, then alphabetically by $\underline{\text{country}}$ $\underline{\mathbf{3}}$, followed by the $\underline{\text{station name}}$ $\underline{\mathbf{6}}$. (If the station name is the same as the country, we don't repeat it, e.g., "Vanuatu, Radio" [Vanuatu].)

If a broadcast is not daily, the days of broadcast (§) will appear in the column following the time of broadcast, using the following codes:

Day Codes

s/S Sunday m/M Monday Tuesday t/T w/W Wednesday h/H Thursday f/F Friday a/A Saturday Daily monthly mon/MON occasional occ:

DRM: Digital Radio Mondiale

In the same column (5), <u>irregular broadcasts</u> are indicated "tent" and programming which includes languages besides English are coded "vl" (various languages).

Choose the most promising frequencies for the time, location and conditions.

The <u>frequencies</u> © follow to the right of the station listing; all frequencies are listed in kilohertz (kHz). Not all listed stations will be heard from your location and virtually none of them will be heard all the time on all frequencies.

Shortwave broadcast stations change some of their frequencies at least twice a year, in April and October, to adapt to seasonal conditions.

But they can also change in response to short-term conditions, interference, equipment problems, etc. Our frequency manager coordinates published station schedules with confirmations and reports from her monitoring team and MT readers to make the Shortwave Guide up-to-date as of one week before print deadline.

9455af

To help you find the most promising signal for your location, immediately following each frequency we've included information on the <u>target</u> area **7** of the broadcast. Signals beamed toward your area will generally be easier to hear than those beamed elsewhere, even though the latter will often still be audible.

Target Areas

af: Africa al: alternat

al: alternate frequency (occasional use only)

am: The Americas as: Asia

au: Australia

ca: Central America do: domestic broadcast

eu: Europe

irr: irregular (Costa Rica RFPI)

me: Middle East na: North America

om: omnidirectional pa: Pacific

South America

va: various

sa.

vu. vuilous

Choose a program or station you want to hear.

Selected programs for prime listening hours appear following the frequencies — space does not permit 24 hour listings nor can every station be listed. However, listings for the most popular stations and selected lesser-known stations illustrate the variety available on shortwave. The format of the listings alternates among three different styles — by station, by genre and by day — month by month. Times listed are approximate and programs are subject to change.

The program listings emphasize broadcasts targeted to North America. In most cases, the stations and programs listed should be readily receivable in North America using a portable radio. Most broadcasters produce one broadcast in English per day that is repeated over a 24 hour period to all areas. If you are able to listen to transmissions to other areas of the world during "nonprime time" hours, referring to the prime time listings for those stations will likely be helpful in determining what programs will be broadcast.

Occasionally, a program or station listing may be followed by a reference to another listing for the same program or station at a different time. This is done to conserve space and make it possible to provide more listings.

MT MONITORING TEAM

Gayle Van Horn John Figliozzi
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Mark Fine, VA markfine@monitoringtimes.com

Program Highlights

John Figliozzi

Realtime Beijing

Last month in this space we clued you into this new and unannounced hour-long transmission from China Radio International at 1100 on 5960 kHz. Here's a more detailed rundown of what you can expect to hear within this magazine program on weekdays:

1100 Top Stories (also on S/A)

1108 City Reports

1115 Business & Markets

1124 Sports News

1130 Top News Headlines & Press Clippings

1135 Feature Highlights

1142 Sci-Tech

1148 Culture & Showbiz (incl. Song of the Day)

Music in Other Languages

Tying in with this month's *Programming Spotlight* column, here are some music programs from the home language services of broadcasters putting strong signals into North America:

Deutsche Welle (DW)

Bunte Noten — \$ 1805, 2205; M 0205. Klassik und Mehr — \$ 1830, 2230; M 0230.

Musik-Thema — M 1940, 2340; T 0340. Schlager — T 2135; W 0135, 0535. Weltmusik — H 1940, 2340; F 0340.

Radio Exterior de España (REE)

Así Sueño — M-F 2030.

La Bañera de Ulises — \$ 0005, 1005, 2205; T 1405, 2205.

Nuestro Sello — M-F 1005.

Radio France Internationale (RFI)

Afro Pop — \$ 2105 (9790, 11955) Couleurs Tropicales — M-F 2110 (9790, 11955)

La Bande Passante — M-F 1430 (15300, 21685); 2030 (9790, 11955) Musiques de Monde — T/W 1410; S 1510 (15300, 21685)

Tu Connais la Chanson — \$ 1430; H 1410 (15300, 21685)

0000 UTC - 7PM EST / 6PM CST / 4PM PS	
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11945as
9890va a 17740va
9950as s
9590na
4835do a 13630pa s 17775va
6150am m 13750na 5990eu
9880as
3290af
9545do 5975ca 11955as s 15360as
5446usb 10320usb sb 13855usb
6130am 11695am
9330na 7315am 11515va
a 5070na
5085na
9505na
7105as 9580na 7325na 15745as
a

0100 UTC - 8PM EST/ 7PM CST / 5PM PST

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0100 0100 0100	0115 0127 0127		Italy, RAI Intl 9675na Czech Rep, Radio Prague Intl Slovakia, Radio Slovakia Intl 9440sa	11800na 6200na 5930na	7345na 7230ca
0100 0100 0100 0100	0127 0130 0130 0130	s mtwhfa twhfa	Vietnam, Voice of 6175na Germany, Universal Life Serbia & Montenegro, Intl Radio USA, Voice of America	9435as 7115na 5995am 9775am	6130am
0100	0130		7405am 9455am Uzbekistan, Radio Tashkent Intl 7160as	5975as	13790am 6165as
0100 0100	0155 0156		Netherlands, Radio 6165na China, China Radio Intl	6140va	9580na
0100	0156		9790na North Korea, Voice of 7140am 9345as	3560as 11735am	6195as
0100	0156		Romania, Radio Romania Intl 9530na 11740na	6040na	9510na
0100 0100 0100 0100 0100	0159 0200 0200 0200 0200		China, China Radio Intl Anguilla, Caribbean Beacon Australia, ABC NT Katherine Australia, ABC NT Tennant Creek Australia, HCJB 15560pa	6140na 6090am 5025do 4910do	
0100	0200		Australia, HCJB 15560pa Australia, Radio 9660pa 15240pa 15415as 17795va 21725as	12080va 17750as	13630pa 17775va
0100 0100 0100 0100 0100 0100	0200 0200 0200 0200 0200 0200		Canada, CBC Northern Service Canada, CFRX Toronto ON Canada, CFVP Calgary AB Canada, CKZN St John's NF Canada, CKZU Vancouver BC Costa Rica, University Network 7375an	9625do 6070do 6030do 6160do 6160do 5030am 11870am	6150am 13750na
0100 0100	0200 0200	1st a	Cuba, Radio Havana Finland, Scandinavian Weekend 11690eu	6000na Radio	9820na 5990eu
0100 0100 0100	0200 0200 0200		Guyana, Voice of 3291do Iran, Voice of the Islamic Rep Japan, Radio 11860as 17560va 17685pa 17845as	5950do 6120na 11880va 17810as	9580na 15325as 17835as
0100 0100	0200 0200		Malaysia, RTM Radio 4 Namibia, Namibian BC Corp 6060af	7295do 3270af	3290af
0100 0100 0100 0100 0100 0100	0200 0200 0200 0200 0200 0200 0200	vl	New Zealand, Radio NZ Intl Sierra Leone, Radio UNAMSIL Singapore, Mediacorp Radio Solomon Islands, SIBC Sri Lanka, SLBC 6005as UK, BBC World Service 9410as9525ca 9825sa 15280as 15310as	17675pa 6139af 6150do 5020do 9770as 5975ca 11955as 15360as	9545do 15745as 6195as 12095sa 17790as
0100 0100	0200 0200		Ukraine, Radio Ukraine Intl USA, Armed Forces Radio 5765usb 6350usb 12133usb 12579usb	5905na 4319usb 7507usb 13362usb	5446usb 10320usb 13855usb
0100 0100 0100 0100	0200 0200 0200 0200		USA, KAIJ Dallas TX 13815va USA, KTBN Salt Lake City UT USA, KWHR Naalehu HI USA, Voice of America 9850va 11705va 15290va 17740va USA, WBCQ Kennebunk ME	7505na 17510as 7200va 11820va 17820va 5105na	7255va 15250va 7415na
0100 0100 0100 0100 0100 0100	0200 0200 0200 0200 0200 0200 0200		9330na USA, WBOH Newport NC USA, WEWN Birmingham AL USA, WHRA Greenbush ME USA, WHRI Noblesville IN USA, WINB Red Lion PA USA, WJIE Louisville KY 13595am	5920am 5825va 7580va 5745va 9320am 7490am	7315am 11515va
0100 0100 0100 0100 0100 0100 0100	0200 0200 0200 0200 0200 0200 0200	sm twhfa m sm	USA, WRMI Miami FL USA, WSHB Cypress Creek SC USA, WSHB Cypress Creek SC USA, WTJC Newport NC USA, WWSS Macon GA USA, WWCR Nashville TN	9955am 7385na 7535na 9430am 9370na 11900na 3210na	5070na
0100	0200		USA, WWRB Manchester TN	5050na	5085na
0100	0200		6890na USA, WYFR Okeechobee FL 15060as	6065na	9505na
0100 0100 0105 0115 0115 0130	0200 0200 0115 0120 0130 0200	vl sm mtwhf	Vanuatu, Radio 3945al Zambia, Christian Voice Austria, Radio Austria Intl Kyrgystan, Radio Kyrghyz Austria, Radio Austria Intl Sweden, Radio 9435va	7260do 4965do 7325am 4010irr 7325am	9870am 4795irr 9870am
0130	0200	twhfa	USA, Voice of America 9455va 13740am	5995am	6130am
0135 0140 0145	0145 0200 0200	sm	Austria, Radio Austria Intl Vatican City, Vatican Radio Austria, Radio Austria Intl	7325am 7335as 7325am	9870am 9865as 9870am

9605am

7210eu

15120me

9770af 9790na 6195as

9515na

4835do

13630pa 17750as

7255do

6150am 13750na

9820na

5980eu

3290af

7350na

9545do 15745as

9680na

7196do 5975ca

9410eu 11765af 15360as 17790as

5446usb

10320usb 13855usb

6035af 7415af 9330na

7315am

11515va

7535eu

5070na

5085na 9505na

17665as

7160eu

15400na

Kinabalu 13675na

		0200) UTC - 9PM EST / 8PM CST / 6P	M PST				0300	UTC - 10PM EST / 9PM CST / 7	PM PST
0200 0200	0227 0228		Czech Rep, Radio Prague Intl	6200na 9835na	7345na	0300	0310		Vatican City, Vatican Radio 9660af 17665as	7305am
0200 0200 0200	0230 0230 0230		Austria, AWR Europe Iran, Voice of the Islamic Rep Serbia & Montenegro, Intl Radio	7230as 6120na 7130na	9580na	0300 0300 0300	0315 0330 0330	sm w fa	Croatia, Voice of 7285na Australia, HCJB 15560pa Belarus, Radio Belarus Intl	5970eu
0200 0200	0230 0256			7555na 4405as	9325as	0300	0330 0330	as	Egypt, Radio Cairo 11780na Philippines, Radio Pilipinas 15270me	12015me
0200	0256		South Korea, Radio Korea Intl 15575na	9560na	11810sa	0300	0330	а	Thailand, Radio 15460na UK, Wales Radio Intl9735na	7555
0200 0200 0200	0259 0300 0300	twhfa	11725am 15150as	6040am 17860am 6090am	9755am	0300 0300 0300 0300	0330 0355 0356 0356		USA, KJES Vado NM South Africa, Channel Africa China, China Radio Intl North Korea, Voice of	7555na 3345af 9690na 3560as
0200 0200 0200	0300 0300 0300	TWITTE	Australia, ABC NT Alice Springs Australia, ABC NT Katherine Australia, ABC NT Tennant Creek	2310irr 5025do 4910do	4835do	0300 0300 0300	0356 0400 0400		7140as9345as Romania, Radio Romania Intl Anguilla, Caribbean Beacon Australia, ABC NT Alice Springs	6040na 6090am 2310irr
0200 0200	0300 0300			12080va 15515va	13630pa 17750as	0300 0300 0300	0400 0400 0400		Australia, ABC NT Katherine Australia, ABC NT Tennant Cree Australia, Radio 9660pa	5025do k 4910do 12080va
0200 0200 0200 0200 0200 0200	0300 0300 0300 0300 0300 0300		Canada, CBC Northern Service Canada, CFRX Toronto ON Canada, CFVP Calgary AB Canada, CKZN St John's NF Canada, CKZU Vancouver BC Costa Rica, University Network	9625do 6070do 6030do 6160do 6160do 5030am 11870am	6150am 13750na	0300 0300 0300 0300 0300 0300	0400 0400 0400 0400 0400 0400	vl	15240pa 15415as 21725as Botswana, Radio 4820do Bulgaria, Radio 7400na Canada, CBC Northern Service Canada, CFRX Toronto ON Canada, CFVP Calgary AB Canada, CKZN St John's NF	15515va 4830al 9400na 9625do 6070do 6030do 6160do
0200 0200 0200	0300 0300 0300	lst a	Cuba, Radio Havana Egypt, Radio Cairo 11780na Finland, Scandinavian Weekend	6000na	9820na 5980eu	0300	0400 0400 0400		Canada, CKZU Vancouver BC Costa Rica, University Network 7375am 9725sa	6160do 5030am 11870am
0200 0200 0200	0300 0300 0300	as	Indonesia, Voice of 9525as	5950do 11785as	17540as	0300 0300	0400 0400	1st a	17645as Cuba, Radio Havana Finland, Scandinavian Weekend 11720eu	
0200 0200 0200	0300 0300 0300		Myanmar, Radio 7185do	7295do 3270af	3290af	0300 0300 0300 0300	0400 0400 0400 0400		Guyana, Voice of 3291do Japan, Radio 21610pa Malaysia, RTM Radio 4 Namibia, Namibian BC Corp	5950do 7295do 3270af
0200 0200	0300 0300	as	New Zealand, Radio NZ Intl Philippines, Radio Pilipinas	17675pa 12015me	15120me	0300	0400 0400		6090af New Zealand, Radio NZ Intl	17675pa
0200	0300			6155na 15595na	7180na	0300	0400		Russia, Voice of 6155na 15445na 15595na	7180na
0200 0200 0200 0200 0200	0300 0300 0300 0300 0300	vl	Sierra Leone, Radio UNAMSIL Singapore, Mediacorp Radio Solomon Islands, SIBC Sri Lanka, SLBC 6005as	6139af 6150do 5020do 9770as 5950na	9545do 15745as 9680na	0300 0300 0300 0300 0300	0400 0400 0400 0400 0400	vl mtwhf	Sierra Leone, Radio UNAMSIL Singapore, Mediacorp Radio Solomon Islands, SIBC Sri Lanka, SLBC 6005as Sudan, Sudan Radio Service	6139af 6150do 5020do 9770as 9625af
0200	0300		11875as 15320as UK, BBC World Service 9410me 9525ca	15465as 5975ca 9750af 15280as	6195eu 9825sa 15310as	0300 0300 0300	0400 0400 0400		Taiwan, Radio Taiwan Intl 11875as Uganda, Radio 4976do UK, BBC World Service 6005af6190af 6195eu	5950na 15320as 5026do 3255af 7160af
0200	0300		USA, Armed Forces Radio 5765usb 6350usb 12133usb 12579usb	4319usb 7507usb 13362usb	5446usb 10320usb 13855usb				9525am 9750af 12035af 15280as 15410af 15575me 21660as	11760me 15310as 17760as
0200 0200 0200 0200	0300 0300 0300 0300		USA, KWHR Naalehu HI USA, Voice of America	7505na 17510as 7200va	7255va	0300	0400		USA, Armed Forces Radio 5765usb 6350usb 12133usb 12579usb USA, KAIJ Dallas TX 5755va	4319usb 7507usb 13362usb
0200 0200 0200	0300 0300	mtwhfa	USA, WBCQ Kennebunk ME USA, WBOH Newport NC USA, WEWN Birmingham AL	11705va 17740va 5105na 5920am 5825va	11820va 17820va	0300 0300 0300	0400 0400 0400		USA, KTBN Salt Lake City UT USA, KWHR Naalehu HI USA, Voice of America 6080af 7265af 7290af 9575af 9885af	7505na 17510as 4960af 7340af
0200 0200 0200 0200	0300 0300 0300 0300		USA, WHRI Noblesville IN USA, WINB Red Lion PA	7580va 5745va 9320am 7490am	7315am 11515va	0300 0300 0300 0300 0300	0400 0400 0400 0400 0400	mtwhfa	USA, WBCQ Kennebunk ME USA, WBCQ Kennebunk ME USA, WBOH Newport NC USA, WEWN Birmingham AL USA, WHRA Greenbush ME	7415na 5105na 5920am 5825va 7580va
0200 0200 0200 0200	0300 0300 0300 0300	twhfa sm mh	USA, WRMI Miami FL USA, WSHB Cypress Creek SC USA, WSHB Cypress Creek SC USA, WTJC Newport NC	7385na 7535na 9430ca 9370na	5070	0300 0300 0300 0300	0400 0400 0400 0400		USA, WHRI Noblesville IN USA, WINB Red Lion PA USA, WJE Louisville KY 13595am USA, WRMI Miami FL	5745va 9320am 7490am
0200 0200	0300		5935na 7465na	3210na 5050na	5070na 5085na	0300 0300 0300 0300	0400 0400 0400 0400	m	USA, WSHB Cypress Creek SC USA, WTJC Newport NC USA, WWCR Nashville TN	5850eu 9370na 3210na
0200	0300		USA, WYFR Okeechobee FL 9505na 9985sa	5985na 11855ca	6065na	0300	0400		5935na 7465na USA, WWRB Manchester TN 6890na	5050na
0200 0200 0215	0300 0300 0220	vl	Zambia, Christian Voice	7260do 4965do 5005as	6100as	0300	0400		USA, WYFR Okeechobee FL 11740sa	6065na
0230 0230	0257 0300		7164as Vietnam, Voice of 6175na Sweden, Radio 9495na			0300 0300 0300 0300	0400 0400 0400 0400	vl vl	Vanuatu, Radio 3945al Zambia, Radio 4910do Zambia, Radio Christian Voice Zimbabwe, ZBC Corp	7260do 6065do 5975do
0245 0245 0250 0250	0300 0300 0300 0300	twhfas	UK, BBC World Service	6115na 9610af 7305am	7160na 9605am	0310 0330 0330 0330 0330	0330 0357 0358 0400 0400	twhfas	Vatican City, Vatican Radio Vietnam, Voice of 6175na Hungary, Radio Budapest Albania, Radio Tirana Intl Malaysia, Radio Malaysia Kota	9660af 9835na 6165eu

Malaysia, Radio Malaysia Kota Sweden, Radio 9495na UAE, Radio Dubai 12005na

0330 0330 0330

0400 0400 0400

17890na UK, BBC World Service 9670eu Tajikistan, Radio 7245irr 0330 0400 7130eu 7265eu 0345 0400

Czech Rep., Radio Prague Intl			0400 U	TC - 11PM EST / 10PM CST / 8	PM PST	
0400 0430 South Africa, Channel Africa South Africa Sout				France, Radio France Intl		
0400 0456	0400	0430		South Africa, Channel Africa Sri Lanka, SLBC 6005as	9770as	15745as
0400 0500 Anguilla, Caribbean Beacon 0690am 0400 0500 Australia, ABC NT Alice Springs 2310ir 2310ir 2400 0500 Australia, ABC NT Katherine 4910do 13630pa 15240pa 15415as 15515va 17750as 177	0400	0455		Netherlands, Radio 6165na China, China Radio Intl	9590na	9560na
0400 0500	0400 0400	0500 0500		Anguilla, Caribbean Beacon Australia, ABC NT Alice Springs	2310irr	4835do
0400 0500				Australia, Radio 9660pa 15240pa 15415as	12080va	
0400 0500 Canada, CKZIV Joncover BC Canada, CKZU Vancover BC Canada, Canada Canada, Canada Canada	0400	0500	vl	Botswana, Radio 4820do Canada, CBC Northern Service	9625do	7255do
0400 0500 1st a Finland, Scandinavian Weekend Radio 5980eu 11720eu Germany, Deutsche Welle 6180af 9545af 9710af 6080af 9710af 9710	0400	0500 0500		Canada, CKZN St John's NF Canada, CKZU Vancouver BC Costa Rica, University Network 7375am 9725sa	6160do 5030am	
0400			1st a	Cuba, Radio Havana Finland, Scandinavian Weekend		
0,000 0,000 Malaysia, Radio Malaysia Kota Kinabalu 7,295 do				Germany, Deutsche Welle 9710af		9545af
New Zealand, Radio NZ Intl	0400 0400 0400	0500 0500 0500		Malaysia, Radio Malaysia Kota Malaysia, RTM Radio 4 Namibia, Namibian BC Corp	5950do	
1350na 12010na 15445na 15595na				New Zealand, Radio NZ Intl	15340pa	7240na
O400				7350na 12010na Sierra Leone, Radio UNAMSIL	6139af	15595na
Name	0400 0400	0500 0500		Solomon Islands, SIBC Sudan, Sudan Radio Service	5020do 9625af	
Q400				9410eu 11760me 15280as 15310as	3255af 6195eu 11765af 15360as	5975am 7160af 12035af 15420af
12133usb 12579usb 13362usb 13855usb 1300	0400	0500	DRM	UK, BBC World Service Ukraine, Radio Ukraine Intl USA, Armed Forces Radio	6010na 5905na 4319usb	5446usb
O400				12133usb 12579usb USA, KAIJ Dallas TX 5755va	13362usb	
0400 0500 mtwhfa USA, WBCQ Kennebunk ME 5105na 7415na 0400 0500 USA, WBCQ Kennebunk ME 9330na 9330na 5920am 0400 0500 USA, WBCM Nemport NC 5920am 5920am 0400 0500 USA, WHRN Birmingham AL 5825na 0400 0500 USA, WHRI Noblesville IN 5745va 7315am 0400 0500 USA, WINB Red Lion PA 9320am 7490am 11515va 0400 0500 USA, WINB Red Lion PA 9465eu 7385na 11515va 0400 0500 Mtha USA, WMLK Bethel PA 9465eu 7385na 0400 0500 Mtha USA, WSHB Cypress Creek SC 12020va 0400 0500 USA, WYRI Newport NC 9370na 0400 0500 USA, WWRB Manchester TN 5050na 5085na 0400 0500 USA, WYFR Okeechobee FL 7365va 7260do 0400 0500 VI Vanuatu, Radio Sy45al 7260do	0400	0500		USA, KWHR Naalehu HI	17780as 4960af	
0400 0500 USA, WHRI Noblesville IN 5745va 7315am 0400 0500 USA, WIRB Red Lion PA 9320am 11515va 0400 0500 USA, WILE Louisville KY 7490am 11515va 0400 0500 mtwhf USA, WMLK Bethel PA 9465eu 0400 0500 USA, WMLK Bethel PA 9465eu 0400 0500 USA, WRMI Miami FL 7385na 0400 0500 USA, WSHB Cypress Creek SC 12020va 0400 0500 USA, WWCR Nashville TN 3210na 5070na 0400 0500 USA, WWRB Manchester TN 5050na 5085na 0400 0500 USA, WYFR Okeechobee FL 6065na 6855va 0400 0500 V Vanuatu, Radio 3945al 7260do 0400 0500 Zambia, Radio Christian Voice 6065do 6065do 0400 0500 Zimbabwe, ZBC Corp 5975do 0415 0420 Mtwhf Kyrgystan, Radio Kyrghyz 4010irr 4795irr<	0400 0400	0500 0500		USA, WBCQ Kennebunk ME USA, WBCQ Kennebunk ME USA, WBOH Newport NC	9330na 5920am	7415na
0400 0500 USA, WJIE Louisville KY 13595am 7490am 11515va 0400 0500 mtwhf USA, WMLK Bethel PA USA, WMRI Miami FL USA, WSRB Cypress Creek SC 12020va 0400 0500 uSA, WSRB Cypress Creek SC 12020va 0400 0500 USA, WTJC Newport NC 9370na 0400 0500 USA, WWCR Nashville TN 3210na 5070na 0400 0500 USA, WWRB Manchester TN 5050na 5085na 0400 0500 USA, WYRF Okeechobee FL 7355va 6890na 7260do 0400 0500 VI Vanuatu, Radio 3945al 7260do 0400 0500 Zambia, Radio Christian Voice 6065do 6065do 0400 0500 Zimbabwe, ZBC Corp 5975do 0415 0420 mtwhf Kyrgystan, Radio Kyrghyz 4010irr 4795irr 0430 0500 Nigeria, Radio/Enugu 6025do 6025do 0430 0500 Nigeria, Radio/Ibadan 4770do 6090do 0430 0500 </td <td>0400</td> <td>0500</td> <td></td> <td>USA, WHRI Noblesville IN</td> <td>5745va</td> <td>7315am</td>	0400	0500		USA, WHRI Noblesville IN	5745va	7315am
O400	0400	0500	. 1.6	USA, WJIE Louisville KY	7490am	11515va
S770na S935na S935na S935na USA, WWRB Manchester TN S050na S085na S890na USA, WYFR Okeechobee FL 6065na 6855va 7355va 9505na S9505na S95	0400 0400	0500 0500		USA, WSHB Cypress Creek SC	7385na 12020va	
Company Comp		0500		5770na 5935na	3210na	
7355va 9505na 10400 10500 10				6890na		
0400 0500 Zambia, Radio Christian Voice 6065do 0400 0500 vl Zimbaowe, ZBC Corp 5975do 0415 0420 mtwhf Kyrgystan, Radio Kyrghyz 4010irr 4795irr 0430 0500 Nigeria, Radio/Enugu 6025do 11600va 0430 0500 Nigeria, Radio/Ibadan 6050do 6090do 0430 0500 Nigeria, Radio/Kaduna 4770do 6090do 0430 0500 Nigeria, Radio/Lagos 3326do 4990do 0430 0500 Swaziland, TWR 4775af 6120af	0400	0500	vl	7355va 9505na Vanuatu, Radio 3945al		003344
0430 0500 Nigeria, Radio/Ibrugu 6050do 0430 0500 Nigeria, Radio/Ibadan 6050do 0430 0500 Nigeria, Radio/Kaduna 4770do 6090do 0430 0500 Nigeria, Radio/Lagos 3326do 4990do 0430 0500 Swaziland, TWR 4775af 6120af	0400 0400 0415	0500 0500 0420		Zambia Radio Christian Voice	5975do 4010irr	
0430 0500 Nigeria, Radio/Lagos 3326do 4990do 0430 0500 Swaziland, TWR 4775af 6120af	0430 0430	0500 0500		Nigeria, Radio/Enugu Nigeria, Radio/Ibadan Nigeria, Radio/Kaduna	6025do 6050do	
	0430 0430	0500 0500		Nigeria, Radio/Lagos Swaziland, TWR 4775af	3326do 6120af	4990do

	0500 UTC - 12AM	I EST / 11PM CST / 9PM PST
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0500 0500 0500	0515 0529 0530		Israel, Kol Israel 6280va Belgium, Radio Vlaanderen Intl France, Radio France Intl	7545va 9590na 11850af	17600va 13610af
0500 0500 0500	0530 0530 0530	DRM/ as as	Netherlands, Radio 15255va UK, BBC World Service UK, BBC World Service	15280as 7295eu	17885af 9670eu
0500	0530		11845eu Vatican City, Vatican Radio 11625af	7360af	9660af
0500 0500	0556 0600		China, China Radio Intl Anguilla, Caribbean Beacon	6190na 6090am	9560na
0500 0500 0500 0500	0600 0600 0600 0600		Australia, ABC NT Alice Springs Australia, ABC NT Katherine Australia, ABC NT Tennant Creek Australia, Radio 9660pa 15160as 15240pa	2310irr 5025do	4835do 13630pa 17750as
0500 0500 0500 0500 0500 0500 0500	0600 0600 0600 0600 0600 0600	mtwhf vl	Bhutan, Bhutan BC Service Botswana, Radio 4820do Canada, CBC Northern Service Canada, CFRX Toronto ON Canada, CKZN St John's NF Canada, CKZU Vancouver BC Costa Rica, University Network	5030al 4830al 9625do 6070do 6160do 6160do 5030am	6035do 7255do
0300	0000		7375am 9725sa 17645as	11870am	13750na
0500	0600		Cuba, Radio Havana 11760na	9550am	9820na
0500	0600	1st a	Finland, Scandinavian Weekend 11690eu 11720eu		6170eu
0500	0600		Germany, Deutsche Welle 12045af 15410af	9565af	11805af
0500 0500 0500	0600 0600 0600	vl	Greece, Voice of 9420eu Guyana, Voice of 3291do Japan, Radio 5975eu 11715eu 11760as 21755pa	12105eu 5950do 6110na 15195as	7230eu 17810as
0500 0500	0600 0600		Kuwait, Radio 15110as	Kinabalu	5979do
0500 0500	0600		Malaysia, Radio Malaysia Kota Malaysia, RTM Radio 4 Namibia, Namibian BC Corp	7295do 6060af	6175al
0500 0500 0500 0500 0500 0500	0600 0600 0600 0600 0600		New Zealand, Radio NZ Intl Nigeria, Radio/Enugu Nigeria, Radio/Ibadan Nigeria, Radio/Kaduna Nigeria, Radio/Lagos Nigeria, Voice of 17800af Russia, Voice of 7125na	15340pa 6025do 6050do 4770do 3326do	6090do 4990do
0500	0600		12010na 15445na	7180na 15595na	7240na
0500 0500 0500	0600 0600 0600	vl	Sierra Leone, Radio UNAMSIL Singapore, Mediacorp Radio Solomon Islands, SIBC	6139af 6150do 5020do	9545do 11710af
0500 0500 0500 0500	0600 0600 0600 0600		South Africa, Channel Africa Swaziland, TWR 6120af Uganda, Radio 4976do UK, BBC World Service 6190af 6195eu 6190af 6195eu 7160af 11765af 11940af 15360as 15420af 17640af 17760as	9525at 7205af 5026do 6005af 9410eu 11955as 15565eu 17790as	9500af 7196do 6135ca 11760me 15310as 15575me 21660as
0500	0600		USA, Armed Forces Radio 5765usb 6350usb 12133usb 12579usb USA, KAIJ Dallas TX 5755va	4319usb 7507usb 13362usb	5446usb 10320usb 13855usb
0500 0500 0500 0500	0600 0600 0600		USA, KTBN Salt Lake City UT USA, KWHR Naalehu HI USA, Voice of America 6105af7170va 7295af 11835af 13710af	7505na 17780as 6035af 9700va 15205va	6080af 11825va
0500 0500 0500 0500 0500 0500 0500	0600 0600 0600 0600 0600 0600 0600	twhfa m	USA, WBCQ Kennebunk ME USA, WBCQ Kennebunk ME USA, WBCQ Kennebunk ME USA, WBOH Newport NC USA, WEWN Birmingham AL USA, WHRA Greenbush ME USA, WHRI Noblesville IN USA, WINB Red Lion PA USA, WJIE Louisville KY	7415na 9330na 5105na 5920am 5825na 7580af 5745va 9320am	7570va 7315am
0500	0600			7490am	11515va
0500 0500 0500 0500 0500 0500	0600 0600 0600 0600 0600	mtwhf m	USA, WMLK Bethel PA USA, WRMI Miami FL USA, WSHB Cypress Creek SC USA, WSHB Cypress Creek SC USA, WTJC Newport NC USA, WWCR Nashville TN	9465eu 7385na 7535eu 12020af 9370na 3210na	5070na
0500	0600		5770na 5935na USA, WWRB Manchester TN	5050na	5085na
0500 0500 0500 0500	0600 0600 0600 0600	vl vl	6890na USA, WYFR Okeechobee FL Vanuatu, Radio 3945al Zambia, Radio Christian Voice Zimbabwe, ZBC Corp	6855eu 7260do 6065do 5975do	7520eu
0515 0525 0530 0530	0525 0600 0545 0550	vl	Rwanda, Radio 6005do Ghana, Ghana BC Corp UK, BBC World Service UAE, Radio Dubai 13675au 21700au	3366do 6010eu 15435au	4915do 9865eu 17830au

0530 0600 mtwhf Thailand, Radio 13780eu

0530	0600	mtwhf	UK, BBC World Service	17885af	
		0600 U	TC - 1AM EST / 12AM CST / 10	PM PST	
0600	0615		South Africa, TWR 11640af		
0600	0620		Vatican City, Vatican Radio 7250eu	4005eu	5890eu
0600	0630		France, Radio France Intl	11725af	15155af
0600	0630 0700		Swaziland, TWR 6120af Anguilla, Caribbean Beacon	7205af 6090am	9500af
0600 0600 0600	0700 0700 0700		Anguilla, Caribbean Beacon Australia, ABC NT Alice Springs Australia, ABC NT Katherine Australia, ABC NT Tennant Creek	5025do	4835do
0600	0700		Australia, Radio 9660pa 15160as 15240pa	11880pa 15515va	12080va 17750as
0600 0600	0700 0700	vl	Rotowana Padio 1820do	4830al 6070do	7255do
0600 0600	0700 0700		Canada, CFRX Toronto ON Canada, CFVP Calgary AB Canada, CKZN St John's NF	6030do 6160do	
0600 0600	0700 0700		Canada, CKZU Vancouver BC Costa Rica, University Network	6160do 5030am	6150am
0.400	0700		7375am 9725sa 17645as	11870am	13750na
0600	0700	1.	Cuba, Radio Havana 11760na	9550am	9820na
0600	0700	1st a	Finland, Scandinavian Weekend 11690eu Georgia, Radio Georgia	11805eu	6170eu
0600	0700		Germany, Deutsche Welle 11785af 15410af	6140eu	7225af
0600 0600	0700 0700	vl	Ghana Ghana BC Corp	3366do 5950do	4915do
0600	0700		Guyana, Voice of 3291do Japan, Radio 7230eu 15195as 17870pa	11690am 21755pa	11740as
0600 0600	0700 0700		Kuwait, Radio 15110as Liberia, ELWA 4760do		
0600 0600	0700 0700		Malaysia, RTM Radio 4 Malaysia, Voice of 6175as	7295do 9665as	9750as
0600 0600	0700		Namibia, Namibian BC Corp	6060af	6175al
0600	0700 0700 0700		New Zealand, Radio NZ Intl Nigeria, Radio/Enugu Nigeria, Radio/Ibadan	15340pa 6025do 6050do	
0600	0700 0700		Nigeria, Radio/Kaduna	4770do 3326do	6090do 4990do
0600 0600	0700 0700		Nigeria, Radio/Lagos Nigeria, Voice of 17800af Papua New Guinea, NBC Russia, Voice of 21790pa	4890do	9675irr
0600 0600	0700 0700		Sierra Leone, Radio UNAMSIL	6139af	
0600	0700 0700	vl	Singapore, Mediacorp Radio Solomon Islands, SIBC	6150do 5020do	9545do
0600 0600 0600	0700 0700 0700		South Africa, Channel Africa Swaziland, TWR 7205af UK, BBC World Service	9525af 9500af 17885af	15215af
0600	0700	as	UK, BBC World Service 6195eu 7160af	6055af 9410eu	6190af 11765af
			11940af 11955as 15360as 15400af	12095eu 15565eu	15310as 15575me
0600	0700		17640af 17760as USA, Armed Forces Radio	17790as 4319usb	21660as 5446usb
			5765usb 6350usb 12133usb 12579usb	7507usb 13362usb	10320usb 13855usb
0600	0700 0700		USA, KAIJ Dallas TX 5755va USA, KTBN Salt Lake City UT	7505na	
0600 0600	0700 0700		USA, KWHR Naalehu Hl USA, Voice of America 6080af 6105af 7170va	17780as 5995va 7295af	6035af
0600	0700	m	11835af 11930va USA, WBCQ Kennebunk ME	11995af 5105na	11825va 15205va
0600	0700 0700	twhfa	USA WBCQ Kennebunk ME	9330na 5920am	
0600 0600	0700 0700		USA, WBOH Newport NC USA, WEWN Birmingham AL USA, WHRA Greenbush ME	5825na 7580af	7570va
0600 0600	0700 0700		USA, WITKI Noblesville IN	5745va 7490am	7315am 11515va
0600	0700		13595am USA, WRMI Miami FL	7385na	
0600	0700 0700	mwfa	USA, WRMI Miami FL USA, WSHB Cypress Creek SC USA, WTJC Newport NC USA, WWCR Nashville TN	7535af 9370na	F070
0600	0700		5770na 5935na USA, WWRB Manchester TN	3210na 5050na	5070na 5085na
0600	0700		6890na USA, WYFR Okeechobee FL	7355eu	11530eu
0600	0700	vl	11580eu Vanuatu, Radio 3945al	4960do	7260irr
0600	0700 0700		Yemen, Rep of Yemen Radio Zambia, Radio Christian Voice	9780me 9865do	
0600 0605	0700 0630	vl s	Zimbabwe, ZBC Corp Austria, Radio Austria Intl	5975do 17870me	
0630 0630	0645 0700	as	UK, BBC World Service Vatican City, Vatican Radio	9875eu 9660af	11625af
0635	0700	s	13765af Austria, Radio Austria Intl	17870me	

0700	IITC -	2 A M	ECT	/ 1 AM	T21	/ 1	1DM	DCT
U/UU	UIL-	ZAIVI	E31	/ I <i>h</i> aivi	COL	/ 1	IPIVI	roi

0700 0700 0700	0715 0726 0727		Croatia, Voice of 13820pa Romania, Radio Romania Intl Slovakia, Radio Slovakia Intl 17550au	11775na 13715au	15105na 15460au			
0700 0700 0700 0700 0700 0700 0700	0730 0730 0745 0800 0800 0800 0800	a as	Tibet, Xizang PBS 9490as UK, BBC World Service USA, WYFR Okeechobee FL Anguilla, Caribbean Beacon Australia, ABC NT Alice Springs Australia, ABC NT Katherine Australia, ABC NT Tennant Creel	9580as 17885af 7355eu 6090am 2310irr 5025do 4910do	9985af 4835do			
0700 0700 0700 0700 0700 0700 0700	0800 0800 0800 0800 0800 0800 0800	vl	Australia, Radio 9660pa 13630pa 15160as Botswana, Radio 4820do Canada, CFRX Toronto ON Canada, CFVP Calgary AB Canada, CKZN St John's NF Canada, CKZU Vancouver BC Costa Rica, University Network	11880pa 15240va 4830al 6070do 6030do 6160do 6160do 5030am	12080va 17750as 7255do			
0700 0700 0700	0800 0800	lst a	7375am 9725sa 17645as Eqt Guinea, Radio Africa Finland, Scandinavian Weekend	11870am 15184af	13750na			
0700 0700 0700 0700 0700 0700	0800 0800 0800 0800 0800 0800	vl	11690eu France, Radio France Intl Germany, Deutsche Welle Ghana, Ghana BC Corp Guyana, Voice of 3291do Kuwait, Radio 15110as Liberia, FIWA 4760do	15605af 6140eu 3366do 5950do	4915do			
0700 0700 0700	0800 0800 0800		Malaysia, Radio Malaysia Kota Malaysia, RTM Radio 4 Malaysia, Voice of 6175as 15295au	Kinabalu 7295do 9665as	5979do 9750as			
0700 0700 0700 0700 0700 0700 0700 070	0800 0800 0800 0800 0800 0800 0800 080		Myanmar, Radio 9730do New Zealand, Radio NZ Intl Nigeria, Radio Enugu Nigeria, Radio/Ibadan Nigeria, Radio/Kaduna Nigeria, Radio/Kaduna Nigeria, Voice of 17800af Papua New Guinea, NBC Russia, Voice of 21790pa	15340pa 6025do 6050do 4770do 3326do 4890do	6090do 4990do 9675irr			
0700 0700 0700 0700 0700 0700 0700	0800 0800 0800 0800 0800 0800 0800	vl	Sierra Leone, Radio UNAMŠIL Singapore, Mediacorp Radio Solomon Islands, SIBC South Africa, Channel Africa Swaziland, TWR 7205af Taiwan, Radio Taiwan Intl UK, BBC World Service 9410eu 11760me 11955as 12095eu 15400af 15485eu	6139af 6150do 5020do 9525af 9500af 5950na 6190af 11765af 15310as 15565eu	9545do 6195eu 11940af 15360as 17640eu			
0700	0800		17760as 17790as USA, Armed Forces Radio 5765usb 6350usb 12133usb 12579usb	21660as 4319usb 7507usb 13362usb	5446usb 10320usb 13855usb			
0700 0700 0700 0700 0700 0700 0700	0800 0800 0800 0800 0800 0800 0800	m	USA, KTBN Salt Lake City UT USA, WBCQ Kennebunk ME USA, WBCQ Kennebunk ME USA, WBCQ Kennebunk ME USA, WBCQ Kennebunk ME USA, WEWN Birmingham AL USA, WHRA Greenbush ME USA, WHRI Noblesville IN USA, WHK Bethel PA USA, WRMI Miami FL USA, WSHB Cypress Creek SC USA, WSHB Cypress Creek SC	7505na 11565pa 5105na 7415na 5920am 5825na 7580af	17780as 7570va			
0700 0700 0700 0700 0700 0700 0700	0800 0800 0800	mtwhf th mtwhas	USA, WTJC Newport NC USA, WWCR Nashville TN	5745va 9465eu 7385na 7535af 9845pa 9370na 3210na	7315am 5070na			
0700 0700 0705 0715 0730	0800 0800 0720 0730 0745	vl mtwhf	Vanuatu, Radio 3945al Zambia, Radio Christian Voice UK, BBC World Service UK, BBC World Service Vatican City, Vatican Radio	4960do 9865do 6005af 15575me 4005eu	7260irr 5890eu			
0730 0730 0730 0730 0730	0800 0800 0800 0800	as	15595va Australia, HCJB 11750pa Bulgaria, Radio 11600eu Guam, TWR/KTWR 15205as Switzerland, Swiss Radio Intl	9645va 13600eu 9885af	11740eu 13790af			
0730 0740 0745 0745 0745 0755 0755	0800 0800 0800 0800 0800 0800 0800	as mtwhf as as mtwhf mtwhf	17665at UK, BBC World Service Guam, TWR/KTWR 15205as Albania, TWR 12070eu Guam, TWR/KTWR 15330as Monaco, TWR 9870eu Albania, TWR 12070eu Monaco, TWR 9870eu	15575me	17885af			
	0800 UTC - 3AM EST / 2AM CST / 12AM PST							

0800 UTC - 3AM EST / 2AM CST / 12AM PST

0800	0804	Pakistan,	Radio	17835eu	21465eu	
0800	0825	Malaysia,	Voice of	6175as	9665as	9750as

			15295au			0900	1000		Anguilla, Caribbean Beacon	6090am	
0800 0800	0827 0829		Czech Rep, Radio Prague Intl Belgium, Radio Vlaanderen Intl	7345eu 5965eu	9880eu	0900 0900	1000		Australia, ABC NT Alice Springs Australia, ABC NT Katherine	2310do 2485do	4835irr
0800	0830		Australia, ABC NT Katherine	5025do		0900	1000		Australia, ABC NT Tennant Creek		
0800 0800	0830 0830		Australia, ABC NT Tennant Creek Malaysia, Radio Malaysia Kota		5979do	0900 0900	1000 1000		Australia, HCJB 11750pa Australia, Radio 9580va	9590as	11880as
0800 0800	0830 0850	а	Myanmar, Radio 9730do Monaco, TWR 9870eu			0900	1000		15240va 15415as Australia, Voice Intl 11955as		
0800 0800	0900 0900	smtwhf	Monaco, TWR 9870eu Albania, TWR 12070eu Anguilla, Caribbean Beacon	400000		0900 0900		vl	Botswana, Radio 4820do Canada, CFRX Toronto ON	4830al 6070do	7255do
0800	0900		Australia, ABC NT Alice Springs	6090am 2310irr	4835do	0900	1000		Canada, CFVP Calgary AB	6030do	
0800 0800	0900 0900		Australia, HCJB 11750pa Australia, Radio 5995na	9580va	9590as	0900 0900	1000 1000		Canada, CKZN St John's NF Canada, CKZU Vancouver BC	6160do 6160do	
			9710pa 12080va 15415as	13630as	15240va	0900	1000		Costa Rica, University Network 7375am 9725sa	5030am 11870am	6150am 13750na
0800 0800	0900 0900	mtwhf vl	Bhutan, Bhutan BC Service Botswana, Radio 4820do	5030al 4830al	6035do 7255do	0900	1000		17645as Eqt Guinea, Radio Africa	15184af	
0800	0900	VI	Canada, CFRX Toronto ON	6070do	723300	0900	1000	1st a	Finland, Scandinavian Weekend		6170eu
0800 0800	0900 0900		Canada, CFVP Calgary AB Canada, CKZN St John's NF	6030do 6160do		0900	1000	DRM/ m-f	11690eu Germany, Deutsche Welle	15440af	17700af
0800 0800	0900 0900		Canada, CKZU Vancouver BC Costa Rica, University Network	6160do 5030am	6150am	0900	1000		21675af Germany, Deutsche Welle	6140eu	15440af
			7375am 9725sa 17645as	11870am	13750na	0900 0900	1000 1000		Guyana, Voice of 3291do Malaysia, RTM Radio 4	5950do 7295do	
0800 0800	0900 0900	1st a	Eqt Guinea, Radio Africa Finland, Scandinavian Weekend	15184af Radio	6170eu	0900 0900	1000 1000		New Zealand, Radio NZ Intl Nigeria, Radio Enugu	9885pa 6025do	
	0900	131 0	11690eu			0900 0900	1000		Nigeria, Radio/Ibadan	6050do	6090do
0800 0800	0900	5511	Germany, Bible Voice Broadcast Germany, Deutsche Welle	6140eu	5975eu	0900	1000		Nigeria, Radio/Kaduna Nigeria, Radio/Lagos	4770do 3326do	4990do
0800 0800	0900 0900	DRM vl	Germany, Deutsche Welle Ghana, Ghana BC Corp	15440af 3366do	21675af 4915do	0900 0900	1000 1000		Nigeria, Voice of 17800af Palua, KHBN 15725as		
0800 0800	0900 0900	as mtwhf	Guam, TWR/KTWR 15205as Guam, TWR/KTWR 15205as	15330as		0900 0900	1000 1000		Papua New Guinea, NBC Russia, Voice of 17495pa	4890do 17525pa	9675irr 17665pa
0800 0800	0900 0900		Guyana, Voice of 3291do Indonesia, Voice of 9525pa	5950do 15150as		0900 0900	1000 1000	vl	Singapore, Mediacorp Radio Solomon Islands, SIBC	6150do 5020do	9545do
0800 0800	0900 0900		Liberia, ÉLWA 4760do Malaysia, RTM Radio 4	7295do		0900 0900		S	UAE, Radio UNMEE21460af UK, BBC World Service	6190af	6195as
0800 0800	0900 0900	mtwhfs	Monaco, TWR 9870eu	9885pa		0700	1000		9605as 9740as 11760me 15190sa 15310as	11940af 15360as	12095eu 15400af
0800	0900		New Zealand, Radio NZ Intl Nigeria, Radio Enugu	6025do					15485eu 15565eu	15575me	17640eu
0800 0800	0900 0900		Nigeria, Radio/Ibadan Nigeria, Radio/Kaduna	6050do 4770do	6090do				17760as 17790as 21470af 21660as	17830af	17885af
0800 0800	0900 0900		Nigeria, Radio/Lagos Nigeria, Voice of 17800af	3326do	4990do	0900	1000		USA, Armed Forces Radio 5765usb 6350usb	4319usb 7507usb	5446usb 10320usb
0800 0800	0900 0900		Papua New Guinea, NBC Russia, Voice of 17495pa	4890do 17525pa	9675irr 17665pa	0900	1000		12133usb 12579usb USA, KTBN Salt Lake City UT	13362usb 7505na	13855usb
0800	0900		21790pa Sierra Leone, Radio UNAMSIL	6139af	·	0900 0900	1000 1000		USA, KWHR Naalehu HI USA, WBOH Newport NC	9930as 5920am	11565pa
0800 0800	0900 0900	vl	Singapore, Mediacorp Radio Solomon Islands, SIBC	6150do 5020do	9545do	0900 0900	1000		USA, WEWN Birmingham AL USA, WHRA Greenbush ME	5825na 7580af	
0000		S									
0800	0900	5	South Africa, Amateur Radio Lea		9750af	0900	1000		USA, WHRI Noblesville IN	5745va	7315am
0800	0900	a	17780af South Africa, Radio League	igue 9750af	9750af 17780af	0900 0900	1000		USA, WHRI Noblesville IN USA, WJIE Louisville KY 13595am	5745va 7490am	7315am 11515va
0800 0800 0800	0900 0900 0900		17780af South Africa, Radio League South Korea, Radio Korea Intl Swaziland, TWR 7205af	9750af 9570as 9500af	9750af	0900 0900 0900 0900	1000 1000 1000		USA, WHRI Noblesville IN USA, WJIE Louisville KY 13595am USA, WRMI Miami FL USA, WTJC Newport NC	5745va 7490am 7385na 9370na	11515va
0800 0800	0900 0900		17780af South Africa, Radio League South Korea, Radio Korea Intl Swaziland, TWR 7205af Taiwan, Radio Taiwan Intl UK, BBC World Service	9750af 9570as 9500af 9610au 6190af	9750af 17780af 13670eu 9410eu	0900 0900 0900 0900 0900	1000 1000 1000 1000		USA, WHRI Noblesville IN USA, WJIE Louisville KY 13595am USA, WRMI Miami FL USA, WTJC Newport NC USA, WWCR Nashville TN 5770na 5935na	5745va 7490am 7385na	11515va 5070na
0800 0800 0800 0800	0900 0900 0900 0900		17780af South Africa, Radio League South Korea, Radio Korea Intl Swaziland, TWR 7205af Taiwan, Radio Taiwan Intl	9750af 9570as 9500af 9610au	9750af 17780af 13670eu	0900 0900 0900 0900	1000 1000 1000	vl	USA, WHRI Noblesville IN USA, WJIE Louisville KY 13595am USA, WRMI Miami FL USA, WTJC Newport NC USA, WWCR Nashville TN 5770na 5935na Vanuatu, Radio 3945al	5745va 7490am 7385na 9370na	11515va
0800 0800 0800 0800	0900 0900 0900 0900		17780af South Africa, Radio League South Korea, Radio Korea Intl Swaziland, TWR 7205af Taiwan, Radio Taiwan Intl UK, BBC World Service 11760me 11940af 15310as 15360as 15565eu 17640eu	9750af 9570as 9500af 9610au 6190af 11955as 15400af 17760as	9750af 17780af 13670eu 9410eu 12095eu 15485eu 17790as	0900 0900 0900 0900 0900 0900 0900 0910	1000 1000 1000 1000 1000 1000 0930	vl s	USA, WHRI Noblesville IN USA, WJIE Louisville KY 13595am USA, WRMI Miami FL USA, WTJC Newport NC USA, WWCR Nashville TN 5770na 5935na Vanuatu, Radio 3945al Zambia, Radio Christian Voice Armenia, Voice of 4810eu	5745va 7490am 7385na 9370na 3210na 4960do 9865do 15270as	11515va 5070na
0800 0800 0800 0800 0800	0900 0900 0900 0900 0900		17780af South Africa, Radio League South Korea, Radio Korea Intl Swaziland, TWR 7205af Taiwan, Radio Taiwan Intl UK, BBC World Service 11760me 11940af 15310as 15360as 15565eu 17640eu 17830af 17885af UK, BBC World Service	9750af 9570as 9500af 9610au 6190af 11955as 15400af 17760as 21470af 15575me	9750af 17780af 13670eu 9410eu 12095eu 15485eu 17790as 21660as	0900 0900 0900 0900 0900 0900 0900 0910 0930 093	1000 1000 1000 1000 1000 1000 0930 1000 100		USA, WHRI Noblesville IN USA, WJIE Louisville KY 13595am USA, WRMI Miami FL USA, WTJC Newport NC USA, WWCR Nashville TN 5770na 5935na Vanuatu, Radio 3945al Zambia, Radio Christian Voice Armenia, Voice of 4810eu Georgia, Radio Georgia Greece, Voice of 9420eu	5745va 7490am 7385na 9370na 3210na 4960do 9865do 15270as 11910me 12105eu	11515va 5070na
0800 0800 0800 0800 0800	0900 0900 0900 0900 0900	a	17780af South Africa, Radio League South Korea, Radio Korea Intl Swaziland, TWR 7205af Taiwan, Radio Taiwan Intl UK, BBC World Service 11760me 11940af 15310as 15360as 15565eu 17640eu 17830af 17885af UK, BBC World Service	9750af 9570as 9570as 9500af 9610au 6190af 11955as 15400af 17760as 21470af 15575me 4319usb 7507usb	9750af 17780af 13670eu 9410eu 12095eu 15485eu 17790as 21660as 5446usb 10320usb	0900 0900 0900 0900 0900 0900 0910 0930 093	1000 1000 1000 1000 1000 0930 1000 1000		USA, WHRI Noblesville IN USA, WJIE Louisville KY 13595am USA, WRMI Miami FL USA, WTJC Newport NC USA, WWCR Nashville TN 5770na 5935na Vanuatu, Radio 3945al Zambia, Radio Christian Voice Armenia, Voice of 4810eu Georgia, Radio Georgia Greece, Voice of 9420eu Lithuania, Radio Vilnius Netherlands, FEBA 9850eu	5745va 7490am 7385na 9370na 3210na 4960do 9865do 15270as 11910me 12105eu 9710eu	11515va 5070na 7260irr
0800 0800 0800 0800 0800 0800	0900 0900 0900 0900 0900 0900	a	17780af South Africa, Radio League South Korea, Radio Korea Intl Swaziland, TWR 7205af Taiwan, Radio Taiwan Intl UK, BBC World Service 11760me 11940af 15310as 15360as 15565eu 17640eu 17830af 17885af UK, BBC World Service USA, Armed Forces Radio 5765usb 6350usb 12133usb 12579usb USA, KNLS Anchor Point AK	9750af 9570as 9500af 9610au 6190af 11955as 15400af 17760as 21470af 15575me 4319usb 7507usb 13362usb 11765as	9750af 17780af 13670eu 9410eu 12095eu 15485eu 17790as 21660as	0900 0900 0900 0900 0900 0900 0910 0930 093	1000 1000 1000 1000 1000 0930 1000 1000	s	USA, WHRI Noblesville IN USA, WJIE Louisville KY 13595am USA, WRMI Miami FL USA, WTJC Newport NC USA, WWCR Nashville TN 5770na 5935na Vanuatu, Radio 3945al Zambia, Radio Geristian Voice Armenia, Voice of 4810eu Georgia, Radio Georgia Greece, Voice of 9420eu Lithuania, Radio Vilnius	5745va 7490am 7385na 9370na 3210na 4960do 9865do 15270as 11910me 12105eu 9710eu	11515va 5070na 7260irr
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			7375am 9725sa	11870am	13750na	11100	1200		Japan, Radio 6120na	9695as	11730as
1000	1100		17645as Eqt Guinea, Radio Africa	15184af		1100 1100	1200 1200		Malaysia, RTM Radio 4 New Zealand, Radio NZ Intl	7295do 15530pa	
1000	1100	1st a	Finland, Scandinavian Weekend 11720eu	Radio	6170eu	1100 1100	1200 1200		Papua New Guinea, NBC Singapore, Radio Singapore Intl	4890do 6150as	9675irr 9600as
1000 1000	1100 1100	mtwhf DRM/ m-f	Germany, Deutsche Welle Germany, Deutsche Welle	17700va 15440eu	17700eu	1100	1200 1200		South Africa, Channel Africa South Africa, Radio Veritas	9525af 7240af	
1000	1100	DRM	Germany, Deutsche Welle	6140eu 5949do	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	1100	1200 1200	DRM/as	Taiwan, Radio Taiwan Intl UK, BBC World Service	7445as 9410eu	
1000	1100		India, All India Radio	7270as	13710as	1100	1200	DRM	UK, BBC World Service UK, BBC World Service	7320eu	21780eu
			15020as 15235as 17800as 17895au	15260as	17510au	1100	1200		9740as11760me 11940at	6190af 12095eu	6195va 15190am
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1000	1100		17585eu 21755pa Malaysia, RTM Radio 4	7295do		1100	1200		17885af 21470af USA, Armed Forces Radio	4319usb	5446usb
1000	1100		New Zealand, Radio NZ Intl	9885pa		1100	1200		5765usb 6350usb	7507usb	10320usb
1000 1000	1100 1100		Palau, KHBN 15725as Papua New Guinea, NBC	4890do	9675irr	1100	1200		12133usb 12579usb USA, KTBN Salt Lake City UT	13362usb 7505na	13855usb
1000 1000	1100 1100	vl	Singapore, Mediacorp Radio Solomon Islands, SIBC	6150do 5020do	9545do	1100 1100	1200 1200	as mtwhf	USA, KWHR Naalehu HI USA, KWHR Naalehu HI	11565pa 9930as	
1000 1000	1100 1100		South Africa, Radio Veritas UK, BBC World Service	7240af 6190af	6195va	1100	1200 1200		USA, WBOH Newport NC USA, WEWN Birmingham AL	5920am 5825na	
			9740as11760me 12095eu 15485eu 15565eu	15190sa 15575me	15310as 17640eu	1100	1200 1200		USA, WHRI Noblesville IN USA, WINB Red Lion PA	9495am 9320am	9840na
1000	1100	DDM	17760as 17790as	17885af	21470af	1100	1200		USA, WJIE Louisville KY	7490am	11515va
1000 1000	1100 1100	DRM DRM/ m	UK, BBC World Service UK, Christian Voice 9760eu	7320eu		1100	1200		13595am USA, WRMI Miami FL	9955am	
1000	1100		USA, Armed Forces Radio 5765usb 6350usb	4319usb 7507usb	5446usb 10320usb	1100	1200 1200	tas	USA, WSHB Cypress Creek SC USA, WTJC Newport NC	6095am 9370na	
1000	1100		12133usb 12579usb USA, KTBN Salt Lake City UT	13362usb 7505na	13855usb	1100	1200		USA, WWCR Nashville TN 5935na 15825na	5070na	5770na
1000	1100		USA, WBOH Newport NC	5920am 5825na		1100	1200		USA, WYFR Okeechobee FL	5950na	7355na
1000	1100		USA, WEWN Birmingham AL USA, WHRI Noblesville IN	9495am	9840na	1100	1200		Zambia, Radio Christian Voice	9865do	
1000	1100		USA, WJIE Louisville KY 13595am	7490am	11515va	1110	1120 1145		Israel, Kol Israel 15640va Nepal, Radio 3230as	17535va 5005as	6100as
1000 1000	1100 1100	а	USA, WRMI Miami FL USA, WSHB Cypress Creek SC	9955am 9455am		1130	1145		7164as Germany, Bible Voice Broadcasti	na	13590as
1000	1100		USA, WTJC Newport NC USA, WWCR Nashville TN	9370na 5070na	5770na	1130 1130	1145 1157		UK, BBC World Service Czech Rep, Radio Prague Intl	7135as 11640eu	11920as 21745va
			5935na 9435na		37701ld	1130	1159		Belgium, Radio Vlaanderen Intl	9945as	2174300
1000 1000	1100 1100	mtwhfa.vl	USA, WYFR Okeechobee FL Vanuatu, Radio 3945al	5950na 4960do	7260irr	1130 1130	1200 1200	а	South Korea, Radio Korea Intl UK, Wales Radio Intl17625au	9650na	
1000 1030	1100 1045	mtwhf	Zambia, Radio Christian Voice Ethiopia, Radio 5990do	9865do 7110do	9704do	1130 1145	1200 1155	f	Vatican City, Vatican Radio Rwanda, Radio 6055do	15595va	17515va
1030 1030	1100 1100	mt hfa	Germany, Deutsche Welle Guam, AWR/KSDA 11900as	15440va		1145	1200		Germany, Bible Voice Broadcasti	ng	13590as
1030	1100		Iran, Voice of the Islamic Rep 21470as 21730as	15480as	15550as			1200	UTC - 7AM EST / 6AM CST / 4A	M DCT	
			214/005 21/3005			1		1200	UIC - / MIII EJI / UMIII CJI / 4M	MVI F J I	
1030	1100		UAE, Radio Dubai 13675eu	15435eu	17865eu				, ,		
1030	1100	t	21605eu UAE, Radio UNMEE21550af			1200	1215		Cambodia, National Radio Of	11940as	05000 (
		t	21605eu	15435eu 9605as	17865eu 11945as	1200 1200 1200	1215 1230 1230		Cambodia, National Radio Of France, Radio France Intl Iran, Voice of the Islamic Rep		25820af 15550as
1030 1030 1030	1100 1100	as	21605eu UAE, Radio UNMEE21550af UK, BBC World Service 15285as 21660as UK, BBC World Service	9605as 15400af		1200	1230 1230 1230		Cambodia, National Radio Of France, Radio France Intl	11940as 17815af	
1030 1030 1030 1030 1045	1100 1100 1100 1100 1100	as mt hfa	21605eu UAE, Radio UNMEE21550af UK, BBC World Service 15285as 21660as UK, BBC World Service Vatican City, Vatican Radio USA, KWHR Naalehu HI	9605as 15400af 5890eu 9930as	11945as	1200 1200 1200 1200	1230 1230 1230 1230	vl	Cambodia, National Radio Of France, Radio France Intl Iran, Voice of the Islamic Rep 21470as 21730as South Korea, Radio Korea Intl UAE, AWR Africa 15135as	11940as 17815af 15480as 9650na	15550as
1030 1030 1030 1030	1100 1100 1100 1100	as	21605eu UAE, Radio UNMEE21550af UK, BBC World Service 15285as 21660as UK, BBC World Service Vatican City, Vatican Radio	9605as 15400af 5890eu	11945as	1200 1200 1200	1230 1230 1230		Cambodia, National Radio Of France, Radio France Intl Iran, Voice of the Islamic Rep 21470as 21730as South Korea, Radio Korea Intl UAE, AWR Africa 15135as UK, BBC World Service Uzbekistan, Radio Tashkent Intl	11940as 17815af 15480as	
1030 1030 1030 1030 1045	1100 1100 1100 1100 1100	as mt hfa as	21605eu UAE, Radio UNMEE21550af UK, BBC World Service 15285as 21660as UK, BBC World Service Vatican City, Vatican Radio USA, KWHR Naalehu HI	9605as 15400af 5890eu 9930as 11565pa	11945as	1200 1200 1200 1200 1200 1200 1200	1230 1230 1230 1230 1230 1230 1255	vI as	Cambodia, National Radio Of France, Radio France Intl Iran, Voice of the Islamic Rep 21470as 21730as South Korea, Radio Korea Intl UAE, AWR Africa 15135as UK, BBC World Service Uzbekistan, Radio Tashkent Intl 6025as 9715as Netherlands, Radio 5965na	11940as 17815af 15480as 9650na 6195ca	15550as 15190am
1030 1030 1030 1030 1045 1045	1100 1100 1100 1100 1100 1100	as mt hfa as	21605eu UAE, Radio UNMEE21550af UK, BBC World Service 15285as 21660as UK, BBC World Service Vatican City, Vatican Radio USA, KWHR Naalehu HI USA, KWHR Naalehu HI	9605as 15400af 5890eu 9930as 11565pa	11945as	1200 1200 1200 1200 1200 1200	1230 1230 1230 1230 1230 1230	vl	Cambodia, National Radio Of France, Radio France Intl Iran, Voice of the Islamic Rep 21470as 21730as South Korea, Radio Korea Intl UAE, AWR Africa 15135as UK, BBC World Service Uzbekistan, Radio Tashkent Intl 6025as9715as Netherlands, Radio 5965na Netherlands, Radio 21780eu China, China Radio Intl	11940as 17815af 15480as 9650na 6195ca 5060as	15550as 15190am
1030 1030 1030 1030 1045	1100 1100 1100 1100 1100 1100	as mt hfa as	21605eu UAE, Radio UNMEE21550af UK, BBC World Service 15285as 21660as UK, BBC World Service Vatican City, Vatican Radio USA, KWHR Naalehu HI USA, KWHR Naalehu HI UTC - 6AM EST / 5AM CST / 3A Pakistan, Radio 17835eu	9605as 15400af 5890eu 9930as 11565pa M PST 21465eu	11945as 17830af	1200 1200 1200 1200 1200 1200 1200 1200	1230 1230 1230 1230 1230 1230 1255 1255	vI as	Cambodia, National Radio Of France, Radio France Intl Iran, Voice of the Islamic Rep 21470as 21730as South Korea, Radio Korea Intl UAE, AWR Africa 15135as UK, BBC World Service Uzbekistan, Radio Tashkent Intl 6025as 9715as Netherlands, Radio 5965na Netherlands, Radio 21780eu China, China Radio Intl 11760pa 11980as	11940as 17815af 15480as 9650na 6195ca 5060as	15550as 15190am 5975as 9760pa
1030 1030 1030 1030 1045 1045	1100 1100 1100 1100 1100 1100 1100	as mt hfa as	21605eu UAE, Radio UNMEE21550af UK, BBC World Service 15285as 21660as UK, BBC World Service Vatican City, Vatican Radio USA, KWHR Naalehu HI USA, KWHR Naalehu HI UTC - 6AM EST / 5AM CST / 3A Pakistan, Radio 17835eu Vanuatu, Radio 3945al Vietnam, Voice of 7285as	9605as 15400af 5890eu 9930as 11565pa	11945as	1200 1200 1200 1200 1200 1200 1200 1200	1230 1230 1230 1230 1230 1230 1255 1255 1256 1259 1300	vI as	Cambodia, National Radio Of France, Radio France Intl Iran, Voice of the Islamic Rep 21470as 21730as South Korea, Radio Korea Intl UAE, AWR Africa 15135as UK, BBC World Service Uzbekistan, Radio Tashkent Intl 6025as 9715as Netherlands, Radio 5965na Netherlands, Radio 11th 11760pa 11980as Canada, Radio Canada Intl Anguilla, Caribbean Beacon	11940as 17815af 15480as 9650na 6195ca 5060as 9730as 15415pa 9795as 11775am	15550as 15190am 5975as 9760pa 11730as
1030 1030 1030 1030 1045 1045 1100 1100 1100 1100	1100 1100 1100 1100 1100 1100 1100	as mt hfa as	21605eu UAE, Radio UNMEE21550af UK, BBC World Service 15285as 21660as UK, BBC World Service Vatican City, Vatican Radio USA, KWHR Naalehu HI USA, KWHR Naalehu HI UTC - 6AM EST / 5AM CST / 3A Pakistan, Radio 17835eu Vanuatu, Radio 3945al Vietnam, Voice of 7285as Australia, HCJB 11750pa Bhutan, Bhutan BC Service	9605as 15400af 5890eu 9930as 11565pa M PST 21465eu 4960do 5030al	11945as 17830af 7260irr	1200 1200 1200 1200 1200 1200 1200 1200	1230 1230 1230 1230 1230 1230 1255 1255 1256 1259 1300 1300 1300	vI as	Cambodia, National Radio Of France, Radio France Intl Iran, Voice of the Islamic Rep 21470as 21730as South Korea, Radio Korea Intl UAE, AWR Africa 15135as UK, BBC World Service Uzbekiston, Radio Tashkent Intl 6025as 9715as Netherlands, Radio 21780eu China, China Radio Intl 11760pa 11980as Canada, Radio Canada Intl Anguilla, Caribbean Beacon Australia, ABC NT Alice Springs Australia, ABC NT Katherine	11940as 17815af 15480as 9650na 6195ca 5060as 9730as 15415pa 9795as 11775am 2310do 2485do	15550as 15190am 5975as 9760pa
1030 1030 1030 1030 1045 1045	1100 1100 1100 1100 1100 1100 1100	as mt hfa as 1100 t	21605eu UAE, Radio UNMEE21550af UK, BBC World Service 15285as 21660as UK, BBC World Service Vatican City, Vatican Radio USA, KWHR Naalehu HI USA, KWHR Naalehu HI UTC - 6AM EST / 5AM CST / 3A Pakistan, Radio 17835eu Vanuatu, Radio 3945al Vietnam, Voice of 7285as Australia, HCJB Bhutan, Bhutan BC Service Tibet, Xizang PBS 4920as UAE, Radio UNMEE21550af	9605as 15400af 5890eu 9930as 11565pa M PST 21465eu 4960do 5030al 6110as	11945as 17830af 7260irr	1200 1200 1200 1200 1200 1200 1200 1200	1230 1230 1230 1230 1230 1230 1255 1255 1256 1259 1300 1300	vI as	Cambodia, National Radio Of France, Radio France Intl Iran, Voice of the Islamic Rep 21470as 21730as South Korea, Radio Korea Intl UAE, AWR Africa 15135as UK, BBC World Service Uzbekistan, Radio Tashkent Intl 6025as9715as Netherlands, Radio 5965na Netherlands, Radio 21780eu China, China Radio Intl 11760pa 11980as Canada, Radio Canada Intl Anguilla, Caribbean Beacon Australia, ABC NT Katherine Australia, ABC NT Katherine Australia, Radio 5995pa	11940as 17815af 15480as 9650na 6195ca 5060as 9730as 15415pa 9795as 11775am 2485do 2325do 6020pa	15550as 15190am 5975as 9760pa 11730as 4835irr
1030 1030 1030 1045 1045 1045 1100 1100 1100 1100 110	1100 1100 1100 1100 1100 1100 1100 11100 1130 1130 1130 1130	as mt hfa as 1100 l	21605eu UAE, Radio UNMEE21550af UK, BBC World Service 15285as 21660as UK, BBC World Service Vatican City, Vatican Radio USA, KWHR Naalehu HI USA, KWHR Naalehu HI UTC - GAM EST / 5AM CST / 3A Pakistan, Radio 17835eu Vanuatu, Radio 3945al Vietnam, Voice of 7285as Australia, HCJB 11750pa Bhutan, Bhutan BC Service Tibet, Xizang PBS 4920as UAE, Radio UNMEE21550af UK, BBC World Service UK, BBC World Service	9605as 15400af 5890eu 9930as 11565pa M PST 21465eu 4960do 5030al 6110as 15400af 6195ca	11945as 17830af 7260irr	1200 1200 1200 1200 1200 1200 1200 1200	1230 1230 1230 1230 1230 1230 1255 1255 1256 1259 1300 1300 1300 1300	vI as	Cambodia, National Radio Of France, Radio France Intl Iran, Voice of the Islamic Rep 21470as 21730as South Korea, Radio Korea Intl UAE, AWR Africa 15135as UK, BBC World Service Uzbekistan, Radio Tashkent Intl 6025as 9715as Netherlands, Radio 5965na Netherlands, Radio 11180eu China, China Radio Intl 11760pa 11980as Canada, Radio Canada Intl Anguilla, Caribbean Beacon Australia, ABC NT Alice Springs Australia, ABC NT Katherine Australia, Radio 5995pa 9475as 9580va 9590as Australia, Voice Intl 13685as	11940as 17815af 15480as 9650na 6195ca 5060as 9730as 15415pa 9795as 11775am 2310do 2485do 2325do 6020pa 11880as	15550as 15190am 5975as 9760pa 11730as 4835irr
1030 1030 1030 1030 1045 1045 1100 1100 1100 1100 1100 110	1100 1100 1100 1100 1100 1100 1100	as mt hfa as 1100 l mtwhfa.vl as t mtwhf DRM	21605eu UAE, Radio UNMEE21550af UK, BBC World Service 15285as 21660as UK, BBC World Service Vatican City, Vatican Radio USA, KWHR Naalehu HI USA, KWHR Naalehu HI UTC - 6AM EST / 5AM CST / 3A Pakistan, Radio 17835eu Vanuatu, Radio 3945al Vietnam, Voice of 7285as Australia, HCJB Bhutan, Bhutan BC Service Tibet, Xizang PBS 4920as UAE, Radio UNMEE21550af	9605as 15400af 5890eu 9930as 11565pa M PST 21465eu 4960do 5030al 6110as 15400af	11945as 17830af 7260irr 6035do 9490as	1200 1200 1200 1200 1200 1200 1200 1200	1230 1230 1230 1230 1230 1230 1255 1255 1256 1259 1300 1300 1300 1300	vI as	Cambodia, National Radio Of France, Radio France Intl Iran, Voice of the Islamic Rep 21470as 21730as 21730as South Korea, Radio Korea Intl UAE, AWR Africa 15135as UK, BBC World Service Uzbekiston, Radio Tashkent Intl 6025as 9715as Netherlands, Radio 21780eu China, China Radio Intl 11760pa 11980as Canada, Radio Canada Intl Anguilla, Caribbean Beacon Australia, ABC NT Katherine Australia, ABC NT Tennant Creek Australia, Radio 5995pa 9475as 9580va 9590as	11940as 17815af 15480as 9650na 6195ca 5060as 9730as 15415pa 9795as 11775am 2485do 2325do 6020pa	15550as 15190am 5975as 9760pa 11730as 4835irr
1030 1030 1030 1045 1045 1100 1100 1100 1100 1100 110	1100 1100 1100 1100 1100 1100 1100 11100 1130 1130 1130 1130 1135 1155	as mt hfa as 1100 l	21605eu UAE, Radio UNMEE21550af UK, BBC World Service 15285as 21660as UK, BBC World Service Vatican City, Vatican Radio USA, KWHR Naalehu HI USA, KWHR Naalehu HI UTC - 6AM EST / 5AM CST / 3A Pakistan, Radio 17835eu Vanuatu, Radio 3945al Vietnam, Voice of 7285as Australia, HCJB 11750pa Bhutan, Bhutan BC Service Tibet, Xizang PBS 4920as UAE, Radio UNMEE21550af UK, BBC World Service UK, BBC World Service Netherlands, Radio 9850eu Netherlands, Radio 9850va UK. BBC World Service Netherlands, Radio 9850va UK. BBC World Service	9605as 15400af 5890eu 9930as 11565pa M PST 21465eu 4960do 5030al 6110as 15400af 6195ca 21780eu 17710eu	11945as 17830af 7260irr 6035do 9490as	1200 1200 1200 1200 1200 1200 1200 1200	1230 1230 1230 1230 1230 1230 1255 1255 1256 1259 1300 1300 1300 1300 1300 1300 1300	vI as	Cambodia, National Radio Of France, Radio France Intliarn, Voice of the Islamic Rep 21470as 21730as 21730as South Korea, Radio Korea Intl UAE, AWR Africa 15135as UK, BBC World Service Uzbekistan, Radio Tashkent Intl 6025as 9715as Netherlands, Radio 5965na Netherlands, Radio 11780eu China, China Radio Intl 11760pa 11980as Canada, Radio Canada Intl Anguilla, Caribbean Beacon Australia, ABC NT Alice Springs Australia, ABC NT Katherine Australia, ABC NT Tennant Creek Australia, Radio 5995pa 9475as 9580va 9590as Australia, Voice Intl 13685as Canada, CBC Northern Service Canada, CFVR Toronto ON Canada, CFVR Tolagary AB	11940as 17815af 15480as 9650na 6195ca 5060as 9730as 15415pa 9795as 11775am 2310do 2485do 2325do 6020pa 11880as 9625do 6070do 6030do	15550as 15190am 5975as 9760pa 11730as 4835irr
1030 1030 1030 1045 1045 1100 1100 1100 1100 1100 110	1100 1100 1100 1100 1100 1100 1100 11100 1130 1130 1130 1130 1135 1155 115	as mt hfa as 1100 l mtwhfa.vl as t mtwhf DRM	21605eu UAE, Radio UNMEE21550af UK, BBC World Service 15285as 21660as UK, BBC World Service Vatican City, Vatican Radio USA, KWHR Naalehu HI USA, KWHR Naalehu HI UTC - GAM EST / 5AM CST / 3A Pakistan, Radio 17835eu Vanuatu, Radio 3945al Vietnam, Voice of 7285as Australia, HCJB 11750pa Bhutan, Bhutan BC Service Tibet, Xizang PBS 4920as UAE, Radio UNMEE21550af UK, BBC World Service UK, BBC World Service UK, BBC World Service Netherlands, Radio 9850eu Netherlands, Radio 9850va UK, BBC World Service Anguilla, Caribbean Beacon Australia, ABC NT Alice Springs	9605as 15400af 5890eu 9930as 11565pa M PST 21465eu 4960do 5030al 6110as 15400af 6195ca 21780eu 17710eu 11775am 2310do	11945as 17830af 7260irr 6035do 9490as	1200 1200 1200 1200 1200 1200 1200 1200	1230 1230 1230 1230 1230 1230 1255 1255 1256 1259 1300 1300 1300 1300 1300 1300 1300 130	vI as	Cambodia, National Radio Of France, Radio France Intl Iran, Voice of the Islamic Rep 21470as 21730as 21730as South Korea, Radio Korea Intl UAE, AWR Africa 15135as UK, BBC World Service Uzbekistan, Radio Tashkent Intl 6025as 9715as Netherlands, Radio 5965na Netherlands, Radio 21780eu China, China Radio Intl 11760pa 11980as Canada, Radio Canada Intl Anguilla, Caribbean Beacon Australia, ABC NT Alice Springs Australia, ABC NT Katherine Australia, ABC NT Tennant Creek Australia, ABC NT Tennant Creek Australia, ABC NT Tennant Creek Australia, Radio 5995pa 9475as 9580va 9590as Australia, Voice Intl 13685as Canada, CBC Northern Service Canada, CFRX Toronto ON Canada, CFVY Calgary AB Canada, CKZN St John's NF Canada, CKZN Vancouver BC	11940as 17815af 15480as 9650na 6195ca 5060as 9730as 15415pa 9795as 11775am 2310do 2485do 2325do 6020pa 11880as 9625do 6070do 6030do 6160do 6160do 6160do	15550as 15190am 5975as 9760pa 11730as 4835irr 6035va 15240va
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1030 1030 1030 1045 1045 1045 1100 1100 1100 1100 110	1100 1100 1100 1100 1100 1100 1100 110	as mt hfa as 1100 l mtwhfa.vl as t mtwhf DRM	21605eu UAE, Radio UNMEE21550af UK, BBC World Service 15285as 21660as UK, BBC World Service Vatican City, Vatican Radio USA, KWHR Naalehu HI Vantalehu HI USA, KWHR Naalehu HI Vantalehu HI	9605as 15400af 5890eu 9930as 11565pa M PST 21465eu 4960do 5030al 6110as 15400af 6195ca 21780eu 17710eu 11775am 2310do 2485do 2325do 6020pa 11880as 6070do	11945as 17830af 7260irr 6035do 9490as 15190ca 4835irr 6035va	1200 1200 1200 1200 1200 1200 1200 1200	1230 1230 1230 1230 1230 1230 1255 1255 1256 1259 1300 1300 1300 1300 1300 1300 1300 130	vI as	Cambodia, National Radio Of France, Radio France Intl Iran, Voice of the Islamic Rep 21470as 21730as South Korea, Radio Korea Intl UAE, AWR Africa 15135as UK, BBC World Service Uzbekistan, Radio Tashkent Intl 6025as 9715as Netherlands, Radio 5965na Netherlands, Radio 11180 Intl 11760pa 11980as Canada, China Radio Intl 11760pa 11980as Canada, Radio Canada Intl Anguilla, Caribbean Beacon Australia, ABC NT Alice Springs Australia, ABC NT Katherine Australia, Radio 5995pa 9475as 9580va 9590as Australia, Voice Intl 13685as Canada, CBC Northern Service Canada, CFRX Toronto ON Canada, CFVP Calgary AB Canada, CKZU Vancouver BC Costa Rica, University Network 7375am 9725sa 17645as Ecuador, HCJB 21455va Finland, Scandinavian Weekend 11720eu	11940as 17815af 15480as 9650na 6195ca 5060as 9730as 15415pa 9795as 11775am 2310do 2485do 2325do 6020pa 11880as 9625do 6070do 6030do 6160do 6160do 5030am 11870am	15550as 15190am 5975as 9760pa 11730as 4835irr 6035va 15240va
1030 1030 1030 1045 1045 1100 1100 1100 1100 1100 110	1100 1100 1100 1100 1100 1100 1100 110	as mt hfa as 1100 l mtwhfa.vl as t mtwhf DRM	21605eu UAE, Radio UNMEE21550af UK, BBC World Service 15285as 21660as UK, BBC World Service Vatican City, Vatican Radio USA, KWHR Naalehu HI Vantalehu HI USA, KWHR Naalehu HI Vantalehu HI	9605as 15400af 5890eu 9930as 11565pa M PST 21465eu 4960do 5030al 6110as 15400af 6195ca 21780eu 17710eu 11775am 2310do 2485do 2325do 6020pa 11880as 6070do 6030do	11945as 17830af 7260irr 6035do 9490as 15190ca 4835irr 6035va	1200 1200 1200 1200 1200 1200 1200 1200	1230 1230 1230 1230 1230 1230 1255 1255 1256 1259 1300 1300 1300 1300 1300 1300 1300 130	vI as DRM	Cambodia, National Radio Of France, Radio France Intl Iran, Voice of the Islamic Rep 21470as 21730as 21730as South Korea, Radio Korea Intl UAE, AWR Africa 15135as UK, BBC World Service Uzbekistan, Radio Tashkent Intl 6025as 9715as Netherlands, Radio 5965na Netherlands, Radio 21780eu China, China Radio Intl 11760pa 11980as Canada, Radio Canada Intl Anguilla, ABC NT Alice Springs Australia, ABC NT Katherine Australia, ABC NT Katherine Australia, Radio 5995pa 9475as 9580va 9590as Australia, Voice Intl 13685as Canada, CBC Northern Service Canada, CFXP Calgary AB Canada, CKZN St John's NF CANADA CKZN S	11940as 17815af 15480as 9650na 6195ca 5060as 9730as 15415pa 9795as 11775am 2310do 2485do 2325do 6020pa 11880as 9625do 6070do 6030do 6160do 6160do 5030am 11870am	15550as 15190am 5975as 9760pa 11730as 4835irr 6035va 15240va
1030 1030 1030 1045 1045 1100 1100 1100 1100 1100 110	1100 1100 1100 1100 1100 1100 1100 110	as mt hfa as 1100 l mtwhfa.vl as t mtwhf DRM	21605eu UAE, Radio UNMEE21550af UK, BBC World Service 15285as 21660as UK, BBC World Service Vatican City, Vatican Radio USA, KWHR Naalehu HI Valtana Seu Service Valtana HI Valtana BC Service LIBA, Radio UNMEE21550af UK, BBC World Service Netherlands, Radio 9850eu NEHERIANS, Radio 9850eu NEHERIANS, RAGIO 9850eu NEHERIANS, RAGIO 9850eu NEHERIANS, RAGIO 9850va UK, BBC World Service Anguilla, Caribbean Beacon Australia, ABC NT Katherine Australia, ABC NT Katherine Australia, Radio 5995pa 9475as9580va 9590as Australia, Voice Intl 13685as Canada, CFRX Toronto ON Canada, CFRY Toronto ON Canada, CFRY Toronto ON Canada, CKZN SI John's NF Canada, CKZN SI John's NF Canada, CKZN VAINCOUPER	9605as 15400af 5890eu 9930as 11565pa M PST 21465eu 4960do 5030al 6110as 15400af 6195ca 21780eu 17710eu 11775am 2310do 2485do 2325do 6020pa 11880as 6070do 6030do 6160do 6160do 6160do	11945as 17830af 7260irr 6035do 9490as 15190ca 4835irr 6035va 15240va	1200 1200 1200 1200 1200 1200 1200 1200	1230 1230 1230 1230 1230 1230 1255 1255 1256 1259 1300 1300 1300 1300 1300 1300 1300 130	vI as DRM	Cambodia, National Radio Of France, Radio France Intl Iran, Voice of the Islamic Rep 21470as 21730as South Korea, Radio Korea Intl UAE, AWR Africa 15135as UK, BBC World Service Uzbekistan, Radio Tashkent Intl 6025as 9715as Netherlands, Radio 5965na Netherlands, Radio 1111760pa 11980as Canada, Radio Intl 11760pa 11980as Canada, Radio Canada Intl Anguilla, Caribbean Beacon Australia, ABC NT Alice Springs Australia, ABC NT Katherine Australia, ABC NT Tennant Creek Australia, ABC NT Tennant Creek Australia, ABC NT Tennant Creek Australia, Voice Intl 13685as Canada, CBC Northern Service Canada, CFRX Toronto ON Canada, CFVP Calgary AB Canada, CKZU Vancouver BC Costo Rica, University Network 7375am 9725sa 17645as Ecuador, HCJB 21455va Finland, Scandinavian Weekend 11720eu Germany, Deutsche Welle Italy, IRRS Malaysia, RTM Radio 4	11940as 17815af 15480as 9650na 6195ca 5060as 9730as 15415pa 9795as 11775am 2310do 2485do 2325do 6020pa 11880as 9625do 6070do 6030do 6160do 6160do 6160do 5030am 11870am Radio 9655eu	15550as 15190am 5975as 9760pa 11730as 4835irr 6035va 15240va 6150am 13750na
1030 1030 1030 1045 1045 1100 1100 1100 1100 1100 110	1100 1100 1100 1100 1100 1100 1100 110	as mt hfa as 1100 l mtwhfa.vl as t mtwhf DRM	21605eu UAE, Radio UNMEE 21550af UK, BBC World Service 15285as 21660as UK, BBC World Service Vatican City, Vatican Radio USA, KWHR Naalehu HI Vatienan, Poice Service Vanuatu, Radio 9845al Vanuatu, Radio UNMEE 21550af UK, BBC World Service UK, BBC World Service UK, BBC World Service UK, BBC World Service Netherlands, Radio 9850eu Netherlands, Radio 9850eu Netherlands, Radio 9850va UK, BBC World Service Anguilla, Caribbean Beacon Australia, ABC NT Katherine Australia, ABC NT Katherine Australia, Radio 5995pa 9475as 9580va 9590as Australia, Voice Intl 13685as Canada, CFRX Toronto ON Canada, CFRX Toronto ON Canada, CFRX Toronto ON Canada, CKZN St John's NF Canada, CKZN St John's NF Canada, CKZN St John's NF Canada, CKZN Uancouver BC Costa Rica, University Network 7375am 9725sa	9605as 15400af 5890eu 9930as 11565pa M PST 21465eu 4960do 5030al 6110as 15400af 6195ca 21780eu 11775am 2310do 2485do 6020pa 11880as 6070do 6030do 60130do 6160do	11945as 17830af 7260irr 6035do 9490as 15190ca 4835irr 6035va	1200 1200 1200 1200 1200 1200 1200 1200	1230 1230 1230 1230 1230 1230 1230 1255 1255 1256 1259 1300 1300 1300 1300 1300 1300 1300 130	vI as DRM	Cambodia, National Radio Of France, Radio France Intl Iran, Voice of the Islamic Rep 21470as 21730as 21730as South Korea, Radio Korea Intl UAE, AWR Africa 15135as UK, BBC World Service Uzbekistan, Radio Tashkent Intl 6025as 9715as Netherlands, Radio 21780eu China, China Radio Intl 11760pa 11980as Canada, Radio Canada Intl Anguilla, Caribbean Beacon Australia, ABC NT Alice Springs Australia, ABC NT Katherine Australia, ABC NT Tennant Creek Australia, ABC NT Tennant Creek Australia, ABC NT Tennant Creek Australia, Voice Intl 13685as Canada, CFVP Calgary AB Canada, CKZN St John's NF Canada, CKZN St John's NF Canada, CKZN University Network 7375am 9725sa 17645as Ecuador, HCJB 21455va Finland, Scandinavian Weekend 11720eu Germany, Deutsche Welle Italy, IRS 13840va Malaysia, RTM Radio 4 New Zealand, Radio NZ Intl Papua New Guinea, NBC	11940as 17815af 15480as 9650na 6195ca 5060as 9730as 15415pa 9795as 11775am 2310do 2485do 2325do 6020pa 11880as 9625do 6010do 6160do 6160do 6160do 6160do 5030am 11870am Radio 9655eu 7295do 15530pa 4890do	15550as 15190am 5975as 9760pa 11730as 4835irr 6035va 15240va 6150am 13750na 6170eu 15440eu
1030 1030 1030 1045 1045 1100 1100 1100 1100 1100 110	1100 1100 1100 1100 1100 1100 1100 110	as mt hfa as 1100 I mtwhfa.vl as t mtwhf DRM DRM/ m-f	21605eu UAE, Radio UNMEE 21550af UK, BBC World Service 15285as 21660as UK, BBC World Service Vatican City, Vatican Radio USA, KWHR Naalehu HI Vattalia, HCJB Note Service USA, BBC World Service UK, BBC World Service Netherlands, Radio 9850eu Netherlands, Radio 9850eu Netherlands, Radio 9850va UK, BBC World Service Anguilla, Caribbean Beacon Australia, ABC NT Katherine Australia, ABC NT Katherine Australia, Radio 5995pa Australia, Roico 1113685as Canada, CFRX Toronto ON Canada, CFRX Toronto ON Canada, CFRX Toronto ON Canada, CFRX Toronto ON Canada, CKZN St John's NF Canada, CK	9605as 15400af 5890eu 9930as 11565pa M PST 21465eu 4960do 5030al 6110as 15400af 6195ca 21780eu 17710eu 11775am 2310do 2485do 6020pa 11880as 6070do 6030do 6160do 6160do 6160do 5030am 11870am	11945as 17830af 7260irr 6035do 9490as 15190ca 4835irr 6035va 15240va	1200 1200 1200 1200 1200 1200 1200 1200	1230 1230 1230 1230 1230 1230 1255 1255 1255 1255 1255 1300 1300 1300 1300 1300 1300 1300 13	vI as DRM	Cambodia, National Radio Of France, Radio France Intl Iran, Voice of the Islamic Rep 21470as 21730as 21730as South Korea, Radio Korea Intl UAE, AWR Africa 15135as UK, BBC World Service Uzbekiston, Radio Tashkent Intl 6025as 9715as Netherlands, Radio 21780eu China, China Radio 21780eu China, China Radio 21180as Canada, Radio Canada Intl Anguilla, Caribbean Beacon Australia, ABC NT Alice Springs Australia, ABC NT Tennant Creek Australia, ABC NT Tennant Creek Australia, Radio 5995pa 9475as 9580va 9590as Australia, Voice Intl 13685as Canada, CBC Northern Service Canada, CFX Toronto ON Canada, CFX Toronto ON Canada, CKZN St John's NF CANADA ST CKZN	11940as 17815af 15480as 9650na 6195ca 5060as 9730as 15415pa 9795as 11775am 2325do 6020pa 11880as 9625do 6020pa 11880as 9625do 6010do 6160do 6160do 6160do 6160do 6160do 6160do 6150as 9655eu 7295do 15530pa 4890do 6150as 9525af	15550as 15190am 5975as 9760pa 11730as 4835irr 6035va 15240va 6150am 13750na 6170eu 15440eu
1030 1030 1030 1045 1045 1100 1100 1100 1100 1100 110	1100 1100 1100 1100 1100 1100 1100 110	as mt hfa as 1100 l mtwhfa.vl as t mtwhf DRM	21605eu UAE, Radio UNMEE21550af UK, BBC World Service 15285as 21660as UK, BBC World Service Vatican City, Vatican Radio USA, KWHR Naalehu HI Vatican Radio Vanuatu, Radio Vanuatu, Radio Vanuatu, Radio USA, BSC World Service Netherlands, Radio UK, BBC World Service Netherlands, Radio 9850eu Netherlands, Radio 9850eu Netherlands, Radio 9850eu Netherlands, Radio 9850va UK, BBC World Service Anguilla, Caribbean Beacon Australia, ABC NT Katherine Australia, ABC NT Katherine Australia, ABC NT Tennant Creek Australia, CRGIO 5995pa 9475as9580va 9590as Australia, Voice Intl 13685as Canada, CFRX Toronto ON Canada, CFRY Toronto ON Canada, CFVY Calgary AB Canada, CKZU Vancouver BC Costa Rica, University Network 7375am 9725sa 17645as	9605as 15400af 5890eu 9930as 11565pa M PST 21465eu 4960do 5030al 6110as 15400af 6195ca 21780eu 17710eu 11775am 2310do 2485do 6020pa 11880as 6070do 6030do 6160do 6160do 6160do 5030am 11870am	11945as 17830af 7260irr 6035do 9490as 15190ca 4835irr 6035va 15240va	1200 1200 1200 1200 1200 1200 1200 1200	1230 1230 1230 1230 1230 1230 1230 1255 1255 1256 1259 1300 1300 1300 1300 1300 1300 1300 130	vI as DRM	Cambodia, National Radio Of France, Radio France Intl Iran, Voice of the Islamic Rep 21470as 21730as 21730as South Korea, Radio Korea Intl UAE, AWR Africa 15135as UK, BBC World Service Uzbekistan, Radio Tashkent Intl 6025as 9715as Netherlands, Radio 21780eu China, China Radio Intl 11760pa 11980as Canada, Radio Canada Intl Anguilla, Caribbean Beacon Australia, ABC NT Alice Springs Australia, ABC NT Alice Springs Australia, ABC NT Tennant Creek Australia, ABC NT Tennant Creek Australia, ABC NT Tennant Creek Australia, Voice Intl 13685as Canada, CFVP Calgary AB Canada, CFVD Vancouver BC Costa Rica, University Network 7375am 9725sa 17645as Ecuador, HCJB 21455va Finland, Scandinavian Weekend 11720eu Germany, Deutsche Welle Italy, IRS 13840va Malaysia, RTM Radio 4 New Zealand, Radio NZ Intl Papua New Guinea, NBC Singapore, Radio Singapore Intl South Africa, Channel Africa South Africa South Africa, Channel Africa South Africa Sou	11940as 17815af 15480as 9650na 6195ca 5060as 9730as 15415pa 9795as 11775am 2310do 2485do 2325do 6020pa 11880as 9625do 6070do 6030do 6160do 5030am 11870am Radio 9655eu 7295do 15530pa 4890do 6150as 9525af 7240af	15550as 15190am 5975as 9760pa 11730as 4835irr 6035va 15240va 6150am 13750na 6170eu 15440eu
1030 1030 1030 1045 1045 1045 1100 1100 1100 1100 110	1100 1100 1100 1100 1100 1100 1100 110	as mt hfa as 1100 t mtwhfa.vl as t mtwhf DRM DRM/ m-f	21605eu UAE, Radio UNMEE21550af UK, BBC World Service 15285as 21660as UK, BBC World Service Vatican City, Vatican Radio USA, KWHR Naalehu HI UTC - 6AM EST / 5AM CST / 3A Pakistan, Radio 17835eu Vanuatu, Radio 3945al Vietnam, Voice of 7285as Australia, HCJB 11750pa Bhutan, BD Service Tibet, Xizang PBS 4920as UAE, Radio UNMEE21550af UK, BBC World Service UK, BBC World Service UK, BBC World Service Netherlands, Radio 9850eu Netherlands, Radio 9850eu Netherlands, Radio 9850va UK, BBC World Service Australia, ABC NT Katherine Australia, ABC NT Tennant Creek Australia, ABC NT Tennant Creek Australia, Radio 5995pa 9475as9580va 9590as Australia, Voice Intl 13685as Canada, CFRX Toronto ON Canada, CFVP Calgary AB Canada, CKZN St John's NF Canada	9605as 15400af 5890eu 9930as 11565pa M PST 21465eu 4960do 5030al 6110as 15400af 6195ca 21780eu 11775am 2310do 2485do 6020pa 11880as 6070do 6030do 6160do	11945as 17830af 7260irr 6035do 9490as 15190ca 4835irr 6035va 15240va	1200 1200 1200 1200 1200 1200 1200 1200	1230 1230 1230 1230 1230 1230 1255 1255 1255 1256 1300 1300 1300 1300 1300 1300 1300 130	vI as DRM 1st a DRM as/vI	Cambodia, National Radio Of France, Radio France Intl Iran, Voice of the Islamic Rep 21470as 21730as 21730as South Korea, Radio Korea Intl UAE, AWR Africa 15135as UK, BBC World Service Uzbekiston, Radio Tashkent Intl 6025as 9715as Netherlands, Radio 21780eu China, China Radio 21780eu China, China Radio 211980as Canada, Radio Canada Intl Anguilla, Caribbean Beacon Australia, ABC NT Alice Springs Australia, ABC NT Katherine Australia, ABC NT Tennant Creek Australia, ABC NT Tennant Creek Australia, ABC NT Fennant Creek Australia, Voice Intl 13685as Canada, CBC Northern Service Canada, CFRX Toronto ON Canada, CFXV Toronto ON Canada, CFXV Uancouver BC Costa Rica, University Network 7375am 9725sa 17645as Ecuador, HCJB 21455va Finland, Scandinavian Weekend 11720eu Germany, Deutsche Welle Italy, IRRS NTM Radio 4 New Zealand, Radio Singapore Intl South Africa, Channel Africa South Africa, Cadio Veritas Taiwan, Radio Veritas Taiwan, Radio Taiwan Intl UK, BBC World Service	11940as 17815af 17815af 15480as 9650na 6195ca 5060as 9730as 15415pa 9795as 11775am 2325do 6020pa 11880as 9625do 6020pa 11880as 9625do 6010do 6160do 6160do 6160do 6160do 61530am 11870am Radio 9655eu 7295do 15530pa 4890do 6150as 9525af 7240af 7240af 7240af 7240af 7320eu	15550as 15190am 5975as 9760pa 11730as 4835irr 6035va 15240va 6150am 13750na 6170eu 15440eu
1030 1030 1030 1045 1045 1100 1100 1100 1100 1100 110	1100 1100 1100 1100 1100 1100 1100 110	as mt hfa as 1100 I mtwhfa.vl as t mtwhf DRM DRM/ m-f	21605eu UAE, Radio UNMEE21550af UK, BBC World Service 15285as 21660as UK, BBC World Service Vatican City, Vatican Radio USA, KWHR Naalehu HI Vatican Radio 17835eu Vanuatu, Radio 2945al Vanuatu, Radio 17805as UAE, Radio UNMEE21550af UK, BBC World Service UK, BBC World Service Netherlands, Radio 9850eu Netherlands, Radio 9850eu Netherlands, Radio 9850eu Netherlands, Radio 9850va UK, BBC World Service Anguilla, Caribbean Beacon Australia, ABC NT Alice Springs Australia, ABC NT Katherine Australia, Radio 5995pa 9475as9580va 9590as Australia, Voice Intl 13685as Canada, CFRV Toronto ON Canada, CFRV Calgary AB Canada, CKZU Vancouver BC Costa Rica, University Network 7375am 9725sa 17645as Ecuador, HCJB 21455va Finland, Scandinavian Weekend 11720eu Germany, Deutsche Welle Germany, Deutsche Welle Germany, Overcomer Ministries	9605as 15400af 5890eu 9930as 11565pa M PST 21465eu 4960do 5030al 6110as 15400af 6195ca 21780eu 17710eu 11775am 2310do 2485do 6020pa 11880as 6070do 6160do 6160do 6160do 6160do 5030am 11870am Radio 17670as 15440eu 6110eu	11945as 17830af 7260irr 6035do 9490as 15190ca 4835irr 6035va 15240va 6150am 13750na 6170eu 21650as 9485eu	1200 1200 1200 1200 1200 1200 1200 1200	1230 1230 1230 1230 1230 1230 1230 1255 1255 1255 1255 1256 1300 1300 1300 1300 1300 1300 1300 130	vI as DRM 1st a DRM as/vI	Cambodia, National Radio Of France, Radio France Intl Iran, Voice of the Islamic Rep 21470as 21730as 21730as South Korea, Radio Korea Intl UAE, AWR Africa 15135as UK, BBC World Service Uzbekistan, Radio Tashkent Intl 6025as 9715as Netherlands, Radio 5965na Netherlands, Radio 21780eu China, China Radio Intl 11760pa 11980as Canada, Radio Canada Intl Anguilla, Caribbean Beacon Australia, ABC NT Alice Springs Australia, ABC NT Katherine Australia, ABC NT Katherine Australia, Radio 5995pa 9475as 9580va 9590as Australia, Voice Intl 13685as Canada, CBC Northern Service Canada, CFXR Toronto ON Canada, CFXP Calgary AB Canada, CKZN St John's NF CANADA ST JOHN ST	11940as 17815af 15480as 9650na 6195ca 5060as 9730as 15415pa 9795as 11775am 2310do 2485do 2325do 6020pa 11880as 9625do 6070do 6160do 6160do 6160do 6160do 6160do 6160do 6150as 9655eu 7295do 15530pa 4890do 6150as 9525af 7240af 7210eu 9410eu 6190af	15550as 15190am 5975as 9760pa 11730as 4835irr 6035va 15240va 6150am 13750na 6170eu 15440eu 9675irr 9600as 21780eu 6195as
1030 1030 1030 1045 1045 1100 1100 1100 1100 1100 110	1100 1100 1100 1100 1100 1100 1100 110	as mt hfa as 1100 t mtwhfa.vl as t mtwhf DRM DRM/ m-f	21605eu UAE, Radio UNMEE21550af UK, BBC World Service 15285as 21660as UK, BBC World Service Vatican City, Vatican Radio USA, KWHR Naalehu HI Valenda, Radio 7285as Australia, HCJB 11750pa Bhutan, Bhutan BC Service Tibet, Xizang PBS 4920as UAE, Radio UNMEE21550af UK, BBC World Service Netherlands, Radio 9850eu UK, BBC World Service Netherlands, Radio 9850eu UK, BBC World Service Netherlands, Radio 9850eu UK, BBC World Service Anguilla, Caribbean Beacon Australia, ABC NT Katherine Australia, ABC NT Katherine Australia, ABC NT Katherine Australia, ABC NT Katherine Australia, Radio 99790as Australia, ABC NT Katherine Australia, Radio 9990as Australia, Voice Intl 13685as Canada, CFRX Toronto ON Canada, CFRX Toronto ON Canada, CFRX Toronto ON Canada, CKZN St John's NF Canada, CKZN St John's NF Canada, CKZN Vancouver BC Costa Rica, University Network 7375am 7725sa 1745bas Ecuador, HCJB 21455va Finland, Scandinavian Weekend 11720eu Germany, Deutsche Welle Germany, Deutsche Welle Germany, Overcomer Ministries 9610eu 11950eu 17485af	9605as 15400af 5890eu 9930as 11565pa M PST 21465eu 4960do 5030al 6110as 15400af 6195ca 21780eu 17710eu 11775am 2310do 2485do 2325do 6020pa 11880as 6070do 6030do 6160do 6160do 6160do 6160do 5030am 11870am Radio 17670as 15440eu 6110eu 13820eu 21720af	11945as 17830af 7260irr 6035do 9490as 15190ca 4835irr 6035va 15240va 6150am 13750na 6170eu 21650as 9485eu 15235me	1200 1200 1200 1200 1200 1200 1200 1200	1230 1230 1230 1230 1230 1230 1230 1255 1255 1256 1259 1300 1300 1300 1300 1300 1300 1300 130	vI as DRM 1st a DRM as/vI	Cambodia, National Radio Of France, Radio France Intl Iran, Voice of the Islamic Rep 21470as 21730as 21730as South Korea, Radio Korea Intl UAE, AWR Africa 15135as UK, BBC World Service Uzbekistan, Radio Tashkent Intl 6025as 9715as Netherlands, Radio 5965na Netherlands, Radio 21780eu China, China Radio Intl 11760pa 11980as Canada, Radio Canada Intl Anguilla, Caribbean Beacon Australia, ABC NT Katherine Australia, ABC NT Katherine Australia, ABC NT Halice Springs Australia, Radio 5995pa 9475as 9580va 9590as Australia, Radio 5995pa 9475as 9580va 9590as Australia, Voice Intl 13685as Canada, CBC Northern Service Canada, CFRX Toronto ON Canada, CFVP Calgary AB Canada, CKZN St John's NF CANADA ST JOHN'S JOHN'S JOHN'S JOHN'S JOHN'S JOHN'S JOHN'S JOHN'S JOHN'	11940as 17815af 15480as 9650na 6195ca 5060as 9730as 15415pa 9795as 11775am 2485do 2325do 6020pa 11880as 9625do 6070do 6160do 6160do 6160do 6160do 6160do 6160do 6150as 7295do 15530pa 4890do 6150as 9525af 7240af 7130as 7320eu 9410eu 6190af 12095eu 115575me	15550as 15190am 5975as 9760pa 11730as 4835irr 6035va 15240va 6150am 13750na 6170eu 15440eu 9675irr 9600as 21780eu 6195as 15310as 17640eu
1030 1030 1030 1045 1045 1100 1100 1100 1100 1100 110	1100 1100 1100 1100 1100 1100 1100 110	as mt hfa as 1100 I mtwhfa.vl as t mtwhf DRM DRM/ m-f	21605eu UAE, Radio UNMEE 21550af UK, BBC World Service 15285as 21660as UK, BBC World Service Vatican City, Vatican Radio USA, KWHR Naalehu HI Vattalia, Radio 2945al Vanuatu, Radio 3945al Vanuatu, Radio 3945al UK, BBC World Service Anguilla, Caribbean Beacon Australia, ABC NT Alice Springs Australia, ABC NT Katherine Australia, ABC NT Tennant Creek Australia, Radio 5995pa 9475as 9580va 9590as Australia, Voice Intl 13685as Canada, CFRX Toronto ON Canada, CFVP Calgary AB Canada, CKZN St John's NF Canada, CKZN St John's NF Canada, CKZU Vancouver BC Costa Rica, University Network 7375am 9725sa 17645as Ecuador, HCJB 21455va Finland, Scandinavian Weekend 11720eu Germany, Deutsche Welle Germany, Deutsche Welle Germany, Oeveromer Ministries 9610eu	9605as 15400af 5890eu 9930as 11565pa M PST 21465eu 4960do 5030al 6110as 15400af 6195ca 21780eu 17710eu 11775am 2310do 2485do 6020pa 11880as 6070do 6030do 6160do 6110eu 13820eu	11945as 17830af 7260irr 6035do 9490as 15190ca 4835irr 6035va 15240va 6150am 13750na 6170eu 21650as 9485eu	1200 1200 1200 1200 1200 1200 1200 1200	1230 1230 1230 1230 1230 1230 1230 1255 1255 1256 1259 1300 1300 1300 1300 1300 1300 1300 130	vI as DRM 1st a DRM as/vI	Cambodia, National Radio Of France, Radio France Intl Iran, Voice of the Islamic Rep 21470as 21730as 21730as South Korea, Radio Korea Intl UAE, AWR Africa 15135as UK, BBC World Service Uzbekiston, Radio Tashkent Intl 6025as 9715as Netherlands, Radio 21780eu China, China Radio 1ntl 11760pa 11980as Canada, Radio Canada Intl Anguilla, Caribbean Beacon Australia, ABC NT Alice Springs Australia, ABC NT Katherine Australia, ABC NT Tennant Creek Australia, ABC NT Tennant Creek Australia, Radio 5995pa 9475as 9580a 9590as Australia, Voice Intl 13685as Canada, CEN Northern Service Canada, CFXX Toronto ON Canada, CFXX Toronto ON Canada, CKZN St John's NF Canada, CKZN St John's NF Canada, CKZU Vancouver BC Costa Rica, University Network 7375am 77645as 17645as 11720eu Germany, Deutsche Welle Italy, IRS 13840va Malaysia, RTM Radio A New Zealand, Radio NZ Intl Papua New Guinea, NBC Singapore, Radio Singapore Intl South Africa, Channel Africa, South Africa, Canic Verice UK, BBC World Service UK, BBC World Service UK, BBC World Service 9740as 11760me 11940af	11940as 17815af 15480as 9650na 6195ca 5060as 9730as 15415pa 9795as 11775am 2310do 2485do 6020pa 11880as 9625do 6010do 6160do 6160do 6160do 6160do 6160do 61530am 11870am Radio 9655eu 7295do 15530pa 4890do 6150as 9525af 7240af 7130as 7320eu 9410eu 6190af 12095eu	15550as 15190am 5975as 9760pa 11730as 4835irr 6035va 15240va 6150am 13750na 6170eu 15440eu 9675irr 9600as 21780eu 6195as 15310as

1200 1200	1300 1300		Ukraine, Radio Ukraine Intl USA, Armed Forces Radio 5765usb 6350usb 12133usb 12579usb	15520eu 4319usb 7507usb 13362usb	5446usb 10320usb 13855usb
1200 1200 1200 1200	1300 1300 1300 1300	as	USA, KTBN Salt Lake City UT USA, KWHR Naalehu HI USA, KWHR Naalehu HI USA, Voice of America 9760va 11705va	7505na 9930as 11565pa 6110va 11715va	9645va 15250va
1200 1200 1200 1200 1200	1300 1300 1300 1300 1300		15425va USA, WBOH Newport NC USA, WEWN Birmingham AL USA, WHRI Noblesville IN USA, WINB Red Lion PA USA, WIE Louisville KY	5920am 5825na 9495am 9320am 7490am	9840na 11515va
1200 1200 1200 1200	1300 1300 1300 1300	а	13595am USA, WRMI Miami FL USA, WSHB Cypress Creek SC USA, WTJC Newport NC USA, WWCR Nashville TN 5935na 15825na	15725na 9455am 9370na 5070na	5770na
1200 1200	1300 1300		USA, WYFR Okeechobee FL 11830na 11970na Zambia, Radio Christian Voice	5950na 13695na 9865do	7355na
1215	1245 1300 1245	m	Germany, Bible Voice Broadcast Egypt, Radio Cairo 15445al UK, BBC World Service		13590as 17780af
1230 1230	1257		21640af Vietnam, Voice of 9840as Australia, HCJB 15405pa	12020as	
1230 1230 1230 1230	1300 1300 1300 1300		Bangladesh, Bangla Betar Bulgaria, Radio 11700eu Sri Lanka, SLBC 6005as Thailand, Radio 9810as	7185as 15700eu 9770as	9550as 15745as

1300 UTC - 8AM EST / 7AM CST / 5AM PST

1300 1300 1300 1300	1330 1330 1355 1356		Ecuador, HCJB 21455va Egypt, Radio Cairo 15445al Poland, Radio Polonia China, China Radio Intl 11760pa 11900as	17670as 9525eu 9570na 11980as	11820eu 9755pa 15180as
1300	1356		11760pa 11900as North Korea, Voice of 9335na 11335eu	4405as 11710am	7505eu
1300 1300 1300	1356 1400 1400		Romania, Radio Romania Intl Anguilla, Caribbean Beacon Australia, Radio 5995pa	15105eu 11775am 6020pa	17745eu 6035va
1300 1300 1300 1300 1300 1300 1300	1400 1400 1400 1400 1400 1400 1400	mtwhf	9580va 9590s Australia, Voice Intl 13685as Canada, CBC Northern Service Canada, CFRX Toronto ON Canada, CFVP Calgary AB Canada, CKZN St John's NF Canada, CKZU Vancouver BC Canada, Radio Canada Intl 17820am	9625do 6070do 6030do 6160do 6160do 9515am	13655am
1300	1400		Costa Rica, University Network 7375am 9725sa 17645as	5030am 11870am	6150am 13750na
1300	1400	1st a	Finland, Scandinavian Weekend 11720eu	Radio	6170eu
1300 1300	1400 1400	DRM	Germany, Deutsche Welle Germany, Deutsche Welle 15440va	9655eu 6140eu	15440eu 9655va
1300 1300 1300 1300 1300	1400 1400 1400 1400 1400	as/vl	Germany, Overcomer Ministries Italy, IRRS 13840va Jordan, Radio 11690eu Malaysia, RTM Radio 4 New Zealand, Radio NZ Intl	6110eu 7295do 9870pa	13810me
1300 1300 1300 1300 1300 1300 1300 1300	1400 1400 1400 1400 1400 1400 1400 1400	DRM DRM/ m-f	Papua New Guinea, NBC Singapore, Radio Singapore Intl South Africa, Radio Veritas South Korea, Radio Korea Intl Sri Lanka, SLBC 6005as UK, BBC World Service UK, BBC World Service UK, BBC World Service 9740as11760me 11940af 15310as 15420af 15575me 17640eu	4890'do 6150as 7240af 9570as 9770as 7320eu 9410eu 6190af 12095eu 15485eu 17760as	9675irr 9600as 13670as 15745as 6195va 15190am 15565eu 17790as
1300	1400		17830af 17885af USA, Armed Forces Radio 5765usb 6350usb	21470af 4319usb 7507usb	5446usb 10320usb
1300 1300 1300 1300	1400 1400 1400 1400		12133usb 12579usb USA, KNLS Anchor Point AK USA, KTBN Salt Lake City UT USA, KWHR Naalehu HI USA, Voice of America	13362usb 9780as 7505na 9930as 6110va	13855usb 9760va
1300 1300 1300 1300 1300 1300 1300	1400 1400 1400 1400 1400 1400 1400	mtwhf	11705va 15425va USA, WBCQ Kennebunk ME USA, WBOH Newport NC USA, WEWN Birmingham AL USA, WHRA Greenbush ME USA, WHRI Noblesville IN USA, WINB Red Lion PA USA, WJIE Louisville KY	17495na 5920am 9955na 17560af 9840na 9930am 7490am	15105am 11515va
1300 1300	1400 1400	as	13595am USA, WRMI Miami FL USA, WSHB Cypress Creek SC	15725na 9430na	

1300 1300 1300	1400 1400 1400	f	USA, WSHB Cypress Creek SC USA, WTJC Newport NC USA, WWCR Nashville TN 12160na 15825na	9455ca 9370na 5935na	9475na
1300	1400		USA, WYFR Okeechobee FL 11740na 11830na	7355na 11970na	11560as 13695na
1300 1305	1400 1315	mtwhfa	Zambia, Radio Christian Voice Turkmenistan, Turkmen Radio	9865do 5015as	
1305 1315	1330 1320	as mtwhf	Austria, Radio Austria Intl Austria, Radio Austria Intl	6155eu 17855as	13730eu
1330	1345		UK, BBC World Service	15105af	21640af
1330	1350		UAE, Radio Dubai 13630eu 17865eu 21605eu	13675eu	15395eu
1330 1330 1330 1330	1357 1400 1400 1400	mt hfa	Vietnam, Voice of 7280eu Australia, HCJB 15405pa Guam, AWR/KSDA 11980as Guam, AWR/KSDA 15660as	9730eu	
1330	1400		India, All India Radio 13710as	9690as	11620as
1330 1330	1400 1400		Laos, National Radio Serbia & Montenegro, Intl Radio	7145as 11835au	
1330 1330	1400 1400	DRM	Sweden, Radio 9430va Sweden, Radio 9815eu	17505va	18960va
1330	1400	DKW	Turkey, Voice of 15155va	15195eu	
1330	1400		Uzbekistan, Radio Tashkent Intl 6025as9715as	5060as	5975as
1335 1345	1345 1400	as	Austria, Radio Austria Intl Austria, Radio Austria Intl	6155eu 6155eu	13730eu 13730eu
1345	1400	mtwhf	Austria, Radio Austria Intl	17855as	13/3060

1400 UTC - 9AM EST / 8AM CST / 6AM PST

		1400 (TIC SAMEST / GAMEST / GA		
1400	1415	fa	Germany, Bible Voice Broadcasti	ng	7485as
1400 1400	1415 1415	mtw	Germany, Bible Voice Broadcasti Serbia & Montenegro, Intl Radio UK, BBC World Service 21490af	9445as 11860af	15420af
1400 1400 1400 1400	1420 1429 1430 1430	DRM	Turkey, Voice of 15155as Czech Rep, Radio Prague Intl Canada, Radio Canada Intl Netherlands. Radio 12070as	15195eu 21745va 9815eu 12080as	15595as
1400 1400	1430 1456 1500		Thailand, Radio 9560as China, China Radio Intl 11765af 13685af Anguilla, Caribbean Beacon	9755na 15125na 11775am	11675as 17720na
1400 1400	1500 1500		Australia, HCJB 15405pa Australia, Radio 5995va 9475as9590va 11750as	6080pa	7240as
1400 1400 1400 1400 1400 1400 1400	1500 1500 1500 1500 1500 1500 1500		Australia, Voice Intl 13635as Canada, CBC Northern Service Canada, CFRX Toronto ON Canada, CFYP Calgary AB Canada, CKZN St John's NF Canada, CKZU Vancouver BC Canada, Radio Canada Intl 17820am	9625do 6070do 6030do 6160do 6160do 9515am	13655am
1400	1500		Costa Rica, University Network 7375am 9725sa 17645as	5030am 11870am	6150am 13750na
1400	1500	1st a	Finland, Scandinavian Weekend 11720eu	Radio	6170eu
1400	1500		France, Radio France Intl 17515as 17620as	7175as	11610as
1400 1400	1500 1500		Germany, Deutsche Welle Germany, Overcomer Ministries 15620as 21590sa	6140eu 6110eu	13810me
1400	1500		India, All India Radio 13710as	9690as	11620as
1400	1500		Japan, Radio 7200as 17755va	9845as	11840va
1400 1400 1400 1400 1400	1500 1500 1500 1500 1500	as	Jordan, Radio 11690eu New Zealand, Radio NZ Intl Oman, Radio 15140eu Singapore, Mediacorp Radio South Africa, Channel Africa Sri Lanka, SLBC 6005as Taiwan, Radio Taiwan Intl	9870pa 6150do 9525af	
1400 1400	1500 1500		Sri Lanka, SLBC 6005as Taiwan, Radio Taiwan Intl	9770as 15265as	15745as
1400 1400	1500 1500	DRM	UK, BBC World Service UK, BBC World Service 7160as9740as 11940af 15310as 15485eu 17640eu 17790as 21660af	7320eu 6190af 12095eu 15565eu 17830af	9410eu 6195as 15190am 15575me 21470af
1400	1500		USA, Armed Forces Radio 5765usb 6350usb 12133usb 12579usb	4319usb 7507usb 13362usb	5446usb 10320usb 13855usb
1400 1400 1400 1400	1500 1500 1500 1500		USA, KJES Vado NM USA, KTBN Salt Lake City UT USA, KWHR Naalehu HI USA, Voice of America 9645va 9760va	11715na 7505na 9930as 6110va 11705va	7125va 15205va
1400 1400 1400 1400 1400 1400 1400	1500 1500 1500 1500 1500 1500 1500	mtwhf	15425va USA, WBCQ Kennebunk ME USA, WBOH Newport NC USA, WEWN Birmingham AL USA, WHRA Greenbush ME USA, WHRI Noblesville IN USA, WINB Red Lion PA USA, WJIE Louisville KY	17495na 5920am 9955na 17560af 9840na 9930am 7490am	15105am 11515va

1400	1500		13595am USA, WRMI Miami FL	15725na	
1400 1400	1500 1500		USA, WTJC Newport NC USA, WWCR Nashville TN 13845na 15825na	9370na 9475na	12160na
1400 1400	1500 1500	mtwhf	USA, WWRB Manchester TN USA, WYFR Okeechobee FL 11830ng 17760am	9320na 11560as	12172na 11740na
1400	1500		Zambia, Radio Christian Voice	9865do	
1415	1420		Nepal, Radio 3230as 7164as	5005as	6100as
1 41 5	1 400	1	0 5:11 1/ 1 5 1		
1415	1430	ha	Germany, Bible Voice Broadcast	ing	7485as
1430	1445		Germany, Bible Voice Broadcast	ing	7485as 7485as
1430 1430	1445 1500		Germany, Bible Voice Broadcast Germany, Pan American BC	ing 13605me	
1430 1430 1430	1445 1500 1500	s ha s	Germany, Bible Voice Broadcast Germany, Pan American BC Myanmar, Radio 5040do	ing 13605me	
1430 1430 1430 1430	1445 1500 1500 1500	s ha	Germany, Bible Voice Broadcast Germany, Pan American BC Myanmar, Radio 5040do Netherlands, Radio 9815eu	13605me 5985do	7485as
1430 1430 1430 1430 1430	1445 1500 1500 1500 1500	s ha s	Germany, Bible Voice Broadcast Germany, Pan American BC Myanmar, Radio 5040do Netherlands, Radio 9815eu Netherlands, Radio 12070as	13605me 5985do 12080as	
1430 1430 1430 1430 1430 1430	1445 1500 1500 1500 1500 1500	s ha s	Germany, Bible Voice Broadcast Germany, Pan American BC Myanmar, Radio 5040do Netherlands, Radio 9815eu Netherlands, Radio 12070as Sweden, Radio 17505va	13605me 5985do 12080as 18960va	7485as 15595as
1430 1430 1430 1430 1430 1430 1445	1445 1500 1500 1500 1500 1500 1500	s ha s	Germany, Bible Voice Broadcast Germany, Pan American BC Myanmar, Radio 5040do Netherlands, Radio 9815eu Netherlands, Radio 12070as Sweden, Radio 17505va Germany, Bible Voice Broadcast	13605me 5985do 12080as 18960va	7485as
1430 1430 1430 1430 1430 1430	1445 1500 1500 1500 1500 1500	s ha s DRM	Germany, Bible Voice Broadcast Germany, Pan American BC Myanmar, Radio 5040do Netherlands, Radio 9815eu Netherlands, Radio 12070as Sweden, Radio 17505va	13605me 5985do 12080as 18960va	7485as 15595as

1500 UTC - 10AM EST / 9AM CST / 7AM PST

			<u> </u>		
1500 1500	1530 1530		Mongolia, Voice of 9720as UK, BBC World Service 21490af	11860af	15420af
1500 1500 1500	1545 1555 1556		Guam, TWR/KTWR 15330as Netherlands, Radio 12070as China, China Radio Intl 11675as 11765as	12080as 7160as 13685af	15595as 9785as 15125af
1500	1556		17720na North Korea, Voice of	4405as	7505eu
1500 1500	1559 1600		9335am 11335eu Canada, Radio Canada Intl 11935as 13655am	11710am 9515am 17820am 11775am	9635as
1500 1500 1500	1600		Anguilla, Caribbean Beacon Australia, HCJB 15405pa Australia, Radio 5995va 9475as 9590as 11750as	6080pa	7240as
1500 1500 1500 1500 1500 1500 1500	1600 1600 1600 1600 1600 1600 1600		Australia, Voice Intl 13635as Canada, CBC Northern Service Canada, CFRX Toronto ON Canada, CFVP Calgary AB Canada, CKZN St John's NF Canada, CKZN Vancouver BC Costa Rica, University Network 7375am 9725sa	9625do 6070do 6030do 6160do 6160do 5030am 11870am	6150am 13750na
1500	1600	1st a	17645as Finland, Scandinavian Weekend 11720eu	Radio	5990eu
1500 1500	1600 1600		Germany, Deutsche Welle Germany, Overcomer Ministries 21590sa	6140eu 6110eu	13810eu
1500 1500	1600 1600	S	Germany, Pan American BC Japan, Radio 7200as 9845as	12015me 9505am	9750as
1500 1500 1500 1500	1600 1600 1600 1600	DRM	Jordan, Radio 11690na Myanmar, Radio 5040do New Zealand, Radio NZ Intl Russia, Voice of 9490eu	5985do 9870pa	
1500	1600		7350as 1 1 500as	7260as	7315as
1500 1500 1500 1500 1500 1500	1600 1600 1600 1600 1600 1600	mtwhf	Seychelles, FEBA 7340as Singapore, Mediacorp Radio South Africa, Channel Africa Sri Lanka, SLBC 6005as Sudan, Sudan Radio Service UK, BBC World Service 6195as7160as 9410eu 12095eu 15190am 15485eu 15565eu 21470af 21660af	6150do 9525af 9770as 15290af 5975as 9740as 15310as 17790as	17770af 15745as 15530af 6190af 11940af 15400af 17830af
1500	1600		USA, Armed Forces Radio 5765usb 6350usb 12133usb 12579usb	4319usb 7507usb 13362usb	5446usb 10320usb 13855usb
1500 1500 1500 1500	1600 1600 1600 1600		USA, KJES Vado NM USA, KTBN Salt Lake City UT USA, KWHR Naalehu HI USA, Voice of America 9575va 9645va	11715na 15590na 9930as 6110va 9760va 15395va	7125va 9765va 15460va
1500 1500 1500 1500 1500 1500 1500	1600 1600 1600 1600 1600 1600	mtwhf	y825vd ISZUSvd USA, WBCQ Kennebunk ME USA, WBOH Newport NC USA, WEWN Birmingham AL USA, WHRA Greenbush ME USA, WHRI Noblesville IN USA, WINB Red Lion PA USA, WJIE Louisville KY 13595am	17495na 5920am 9955na 17650af 9840na 9930am 7490am	15105am 11515va
1500 1500 1500	1600 1600 1600		USA, WRMI Miami FL USA, WTJC Newport NC USA, WWCR Nashville TN	15725na 9370na 9475na	12160na
1500 1500	1600 1600	mtwhf	13845na 15825na USA, WWRB Manchester TN USA, WYRB Okeechobee FL	9320na 6280as	12172na 11830na
1500	1600		15520as 17760na Zambia, Radio Christian Voice	4965do	

1515 1515		as	Germany, Bible Voice Broadcasti Vatican City, Vatican Radio 15235as		9860me 13765as
1530 1530 1530 1530	1600 1600 1600 1600	m whfa	Germany, Bible Voice Broadcasti Germany, Bible Voice Broadcasti Iran, Voice of the Islamic Rep UAE, AWR Africa 15225as	ng	12005me 9705as 9610as
1530 1530	1600 1600	а	UK, BBC World Service Vatican City, Vatican Radio 15235af	11685as 9865af	15540as 13765af

1600 UTC - 11AM EST / 10AM CST / 8AM PST

1600	1615		Pakistan, Radio 9395me 15725af 17820af	11570me	11640af
1600 1600 1600	1627 1628 1630	s	Vietnam, Voice of 7280as Hungary, Radio Budapest Guam, AWR/KSDA 15495as	9730as 6025eu	9585eu
1600 1600 1600	1630 1630 1635		Iran, Voice of the Islamic Rep Sri Lanka, SLBC 6005as UAE, Radio Dubai 13630eu	7190as 9770as 13675eu	9610as 15745as 15395eu
1600	1656		17865eu 21605eu China, China Radio Intl	7190af	9570af
1600	1656		13685af 15125af North Korea, Voice of	3560as	9975af
1600	1659	as	11735af Canada, Radio Canada Intl	9515am	13655am
1600	1700		17820am Anguilla, Caribbean Beacon	11775am	
1600 1600	1700 1700		Australia, HCJB 15405pa Australia, Radio 5995va 9475as	6080pa	7240as
1600 1600 1600 1600 1600 1600 1600	1700 1700 1700 1700 1700 1700 1700		Australia, Voice Intl 13635as Canada, CBC Northern Service Canada, CFRX Toronto ON Canada, CFVP Calgary AB Canada, CKZN St John's NF Canada, CKZN Vancouver BC Costa Rica, University Network 7375am 9725sa	9625do 6070do 6030do 6160do 6160do 5030am 11870am	6150am 13750na
1600	1700		17645as Ethiopia, Radio 5990af	7110af	7165af
1600	1700	1st a	9560af 9704af 11800af Finland, Scandinavian Weekend	Radio	5990eu
1600	1700		11720eu France, Radio France Intl 15160af 15605af	9730af 17605af	11615af 17850af
1600 1600 1600	1700 1700 1700	DRM	Germany, Bible Voice Broadcastin Germany, Deutsche Welle Germany, Deutsche Welle	ng 6140eu 6170as	9860me 7225as
1600	1700		11695as Jordan, Radio 11690na		
1600 1600	1700 1700		New Zealand, Radio NZ Intl Russia, Voice of 4940va	9870pa 4965va	4975va
1600	1700		6005me 7260as South Korea, Radio Korea Intl 9870va	9830me 5975om	7255va
1600 1600	1700 1700	mtwhf	Sudan, Sudan Radio Service Taiwan, Radio Taiwan Intl	15290af 11550as	15530af
1600	1700		UK, BBC World Service 6190af 6195as 7160as 11940af 12095eu 15400af 15485eu 17830af 21470af	3915as 9410eu 15190am 15565eu 21660af	5975as 9510as 15310as 17790as
1600	1700		USA, Armed Forces Radio 5765usb 6350usb	4319usb 7507usb	5446usb 10320usb
1600 1600 1600	1700 1700 1700		12133usb 12579usb USA, KTBN Salt Lake City UT USA, KWHR Naalehu HI USA, Voice of America 7125va 9575va 13600va 13710af 15395va 15240af 17715af 17895af	13362usb 15590na 9930as 6035af 9645va 15205va 15445va	13855usb 6110va 9760va 15225af 17640va
1600 1600 1600 1600	1700 1700 1700 1700	mtwhf	USA, WBCQ Kennebunk ME USA, WBOH Newport NC USA, WEWN Birmingham AL USA, WHRA Greenbush ME USA, WHRI Noblesville IN USA, WINB Red Lion PA	17495na 5920am 13615na 17650af	17840af
	1700		USA, WHRI Noblesville IN USA, WINB Red Lion PA	13760va 9930am	15105am
1600	1700		13595am	7490am	11515va
1600 1600 1600 1600 1600	1700 1700 1700 1700 1700	mtwhf a	USA, WMLK Bethel PA USA, WRMI Miami FL USA, WSHB Cypress Creek SC USA, WTJC Newport NC USA, WWCR Nashville TN	9465eu 15725na 17665af 9370na 9475na	12160na
1600 1600	1700 1700	mtwhf	13845na 15825na USA, WWRB Manchester TN USA, WYFR Okeechobee FL 15520na 17760na	9320na 11830na 17790af	12172na 11865na 18980eu
1600 1605 1610 1625	1700 1610 1625 1630	as as	21455eu Zambia, Radio Christian Voice Austria, Radio Austria Intl Austria, Radio Austria Intl Austria, Radio Austria Intl	4965do 17865na 17865na 17865na	
1630 1630 1630	1700 1700 1700		Egypt, Radio Cairo 9855af Georgia, Radio Georgia Guam, AWR/KSDA 11980as	6180me 15495as	

1630	1700	S	Ireland, Reflections Europe 12255eu	3910eu	6295eu
1630	1700		UK, BBC World Service	15420af	01.400 [
	1700	as	UK, BBC World Service	11860af	21490af
1635	1640	as	Austria, Radio Austria Intl	17865na	
1640	1650	mtwhfa	Turkmenistan, Turkmen Radio	4930as	
1640	1655		Austria, Radio Austria Intl	17865na	
1645	1700		Tajikistan, Radio 7245irr		
1655	1700	as	Austria, Radio Austria Intl	17865na	

1700 UTC - 12PM EST / 11AM CST / 9AM PST

		.,,,,,	TC - 12PM E31 / 1 IAM C31 / 3	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
1700 1700 1700	1715 1727 1727	vl	Somalia, Radio Galkayo Czech Rep, Radio Prague Intl Vietnam, Voice of 9725eu	6985va 5930eu	9615va 17485af
1700 1700 1700	1730 1730 1730		Azerbaijan, Voice of 6110eu France, Radio France Intl Jordan, Radio 11690na	9155eu 11615af	15605af
1700 1700 1700 1700	1730 1745 1750 1756	mtwhf	Moldova, Radio Pridnestrovye UK, BBC World Service New Zealand, Radio NZ Intl China, China Radio Intl 13685af 15125af	5960eu 6005eu 9870pa 7190af	9570af
1700 1700	1800 1800		Anguilla, Caribbean Beacon Australia, Radio 5995va 9475as 9710va 11880va	11775am 6080pa	7240as
1700 1700 1700 1700 1700 1700 1700	1800 1800 1800 1800 1800 1800 1800		Australia, Voice Intl 13635as Canada, CBC Northern Service Canada, CFRX Toronto ON Canada, CFVP Calgary AB Canada, CKZN St John's NF Canada, CKZU Vancouver BC Costa Rica, University Network 7375am 9725sa	9625do 6070do 6030do 6160do 6160do 5030am 11870am	6150am 13750na
1700 1700 1700	1800 1800 1800	lst a	17645as Egypt, Radio Cairo 9855af Eqt Guinea, Radio Africa Finland, Scandinavian Weekend 11720eu	7189af I Radio	15184al 5990eu
1700 1700 1700	1800 1800 1800	a w fa as DRM	Germany, Bible Voice Broadcast Germany, Bible Voice Broadcast Germany, Deutsche Welle	ing 6140eu	9860me 11650me
1700 1700 1700 1700	1800 1800 1800 1800	a s	Germany, Overcomer Ministries Germany, Radio Africa Intl Greece, Voice of 9420na Ireland, Reflections Europe 12255eu	5870va 11735af 15630eu 3910eu	13820af 17705na 6295eu
1700 1700 1700 1700	1800 1800 1800 1800		Japan, Radio 9535am Russia, Voice of 5910as Swaziland, TWR 3200af	11970eu 5945as 9500af 11550as	15355af 9830af
1700	1800		UK, BBC World Service 5975as6190af 6195eu 9510as9630af 12095eu 15420af 15565eu	3255af 7160as 15310as 17830af	3915as 9410eu 15400af 21470af
1700	1800		USA, Armed Forces Radio 5765usb 6350usb 12133usb 12579usb USA, KTBN Salt Lake City UT	4319usb 7507usb 13362usb 15590na	5446usb 10320usb 13855usb
1700	1800		USA, Voice of America 7125va 9645va 15205va 15240af 17895af	6040va 9760va 15395va	6110va 13710af 15445af
1700	1800	mtwhf	USA, Voice of America 9525va 9795va 13600af 15255va	5990va 11955va	6045va 12005va
1700 1700 1700	1800 1800 1800	mtwhf	USA, WBCQ Kennebunk ME USA, WBOH Newport NC USA, WEWN Birmingham AL	9330na 5920am 13615na	17495na 17840af
1700 1700 1700 1700	1800 1800 1800 1800		USA, WHRA Greenbush ME USA, WHRI Noblesville IN USA, WINB Red Lion PA USA, WJIE Louisville KY	17650af 13760va 9930am 7490am	15105am 11515va
1700 1700 1700 1700 1700	1800 1800 1800 1800 1800	mtwhf ta	13595am USA, WMLK Bethel PA USA, WRMI Miami FL USA, WSHB Cypress Creek SC USA, WTJC Newport NC USA, WWCR Nashville TN	9465eu 15725na 17505af 9370na 9475na	12160na
1700 1700	1800 1800	smtwhf	13845na 15825na USA, WWRB Manchester TN USA, WYFR Okeechobee FL	9320na 18980eu	12172na 21455eu
1700 1715	1800 1730		21680af Zambia, Radio Christian Voice Vatican City, Vatican Radio 7250eu 9645eu	4965do 4005eu 15595va	5890eu
1730 1730	1726 1740	vl	Romania, Radio Romania Intl Libya, Voice of Africa 15660irr 17880irr	9570eu 15220irr	11940eu 15615irr
1730	1745	mtwhf	UK, United Nations Radio 21535af	7170af	15495me
1730 1730 1730	1800 1800 1800		Guam, AWR/KSDA 11560me Liberia, ELWA 4760do Philippines, Radio Pilipinas	11730me	11890me
1730	1800		15190me Slovakia, Radio Slovakia Intl	5915eu	6055eu
1730	1800		7345eu Switzerland, Swiss Radio Intl 15555 skd1203	9755af	11810af

1730	1800		UK, BBC World Service 7105eu 7230af	3390af 9530eu	5875eu 9685af
1730	1800		Vatican City, Vatican Radio 17515af	13765af	15570af
1735 1745 1745 1745	1745 1755 1800 1800	vl/th mtwhfa	Paraguay, Radio Nacional Turkmenistan, Turkmen Radio Bangladesh, Bangla Betar India, All India Radio 9950eu 11620eu	9739sa 4930as 7185eu 7410eu 11935af	15550eu 9445af 13605af
1751	1800		15075af 15155af New Zealand, Radio NZ Intl	17670af 11980pa	

1800 UTC - 1PM EST / 12PM CST / 10AM PST

1800 1800 1800 1800 1800 1800 1800	1810 1815 1815 1815 1827 1827 1830	а	Zanzibar, Voice of Tanzania Bangladesh, Bangla Betar Germany, Bible Voice Broadcasti Israel, Kol Israel 9435va Czech Rep, Radio Prague Intl Vietnam, Voice of 7280eu Egypt, Radio Cairo 9855af	11734do 7185eu ng 11585va 5930eu 9725eu	15520eu 13845me 17535va 9415va 9730al
1800 1800	1830 1830	S	Germany, Universal Life South Africa, AWR Africa 11985af	11840af 5960af	7265af
1800 1800 1800 1800 1800	1830 1855 1900 1900 1900	mtwhf	UK, BBC World Service Poland, Radio Polonia Anguilla, Caribbean Beacon Argentina, RAE 9690eu Australia, HCJB 11765pa	5975as 5995eu 11775am 15345eu	9510as 7150eu
1800 1800	1900 1900		Australia, Radio 6080pa 9580va 9710pa Australia, Voice Intl 11685as	7240va 11880va	9475as
1800 1800 1800 1800 1800 1800	1900 1900 1900 1900 1900 1900		Canada, CBC Northern Service Canada, CFRX Toronto ON Canada, CFVP Calgary AB Canada, CKZN St John's NF Canada, CKZU Vancouver BC Costa Rica, University Network 7375am 9725sa	9625do 6070do 6030do 6160do 6160do 5030am 11870am	6150am 13750na
1800 1800	1900 1900	1st a	17645as Eqt Guinea, Radio Africa Finland, Scandinavian Weekend 11720eu	7189af Radio	15184al 6170eu
1800 1800	1900 1900		Germany, Radio Africa Intl India, All India Radio 9950eu 11620eu 15075af 15155af	11735af 7410eu 11935af 17670af	13820af 9445af 13605af
1800	1900	S	Ireland, Reflections Europe 12255eu	3910eu	6295eu
1800 1800 1800 1800 1800 1800	1900 1900 1900 1900 1900 1900 1900		Kuwait, Radio 11990va Latvia, Laser Radio 9290eu Liberia, ELWA 4760do Netherlands, Radio 6020af New Zealand, Radio NZ Intl Nigeria, Voice of 15120af Philippines, Radio Pilipinas	9895af 11980pa 17800al 11730me	11655af
1800	1900		15190me Russia, Voice of 5910as	5945as	7290eu
1800 1800 1800 1800 1800 1800 1800	1900 1900 1900 1900 1900 1900 1900	as as	9830af 11510af Russia, Voice of 5950eu Sierra Leone, Radio UNAMSIL South Africa, Channel Africa South Africa, Radio Lusofonia Swaziland, TWR 3200af Taiwan, Radio Taiwan Intl UK, BBC World Service 6190af 6195eu 9410eu 15310me 15400af 21470af	6175eu 6139af 15265af 3345af 9500af 3955eu 3255af 9630af 15420af	6055af 12095eu 17830af
1800	1900		USA, Armed Forces Radio 5765usb 6350usb 12133usb 12579usb	4319usb 7507usb 13362usb	5446usb 10320usb 13855usb
1800 1800	1900 1900		USA, KTBN Salt Lake City UT USA, Voice of America 9760va 9885va	15590na 6035af 11975af	6040va 13710af
1800 1800 1800 1800 1800 1800 1800	1900 1900 1900 1900 1900 1900 1900	mtwhfa	15240af 15580af USA, WBCQ Kennebunk ME USA, WBOH Newport NC USA, WEWN Birmingham AL USA, WHRA Greenbush ME USA, WHRI Noblesville IN USA, WINB Red Lion PA USA, WJIE Louisville KY	17895af 9330na 5920am 13615na 17650af 9495am 9930am 7490am	17495na 17840af 13760va 11515va
1800 1800 1800 1800 1800	1900 1900 1900 1900 1900	mtwhf a	13595am USA, WMLK Bethel PA USA, WRMI Miami FL USA, WSHB Cypress Creek SC USA, WTJC Newport NC USA, WWCR Nashville TN USA, WWCR Nashville TN	9465eu 15725na 15665eu 9370na 9475na	17505af 12160na
1800 1800 1800 1800 1815	1900 1900 1900 1900 1900	smtwhf	13845na 15825na USA, WWRB Manchester TN USA, WYFR Okeechobee FL Yemen, Rep of Yemen Radio Zambia, Radio Christian Voice Bangladesh, Bangla Betar	9320na 18980eu 9780me 4965do 7185eu	12172na 9550eu
1820	1830	vl	15550eu Libya, Voice of Africa 11860irr 17880irr	11635irr	11715irr
1830	1845		Germany, IBRA Radio	9520af	

1850 1845 m w W. Balt World Service 6050au 7105au 1900 2000 190				/			_	_				
1889 1889 286 286				mtwhf			7105eu	6050eu		m w	1845	1830
1900 1900		15665eu	USA, WSHB Cypress Creek SC	а	2000	1900	7330eu		Belgium, Radio Vlaanderen Intl			
1900 min/nth 1900	101/0	9370na	USA, WTJC Newport NC		2000	1900		7500eu	Bulgaria, Radio 5800eu		1900	1830
1900 1900	12160na		13845na 15825na	a matuula f					South Africa, AWR Africa	m tu la fa	1900	1830
1900 UTC - 2PM EST / 1PM CST / 11M PST	12172na 15115af		USA, WYFR Okeechobee FL	smiwni			5985af	4765af		mtwnta		
1900 1915 1916		4965do	Vanuatu, Radio 3945al Zambia, Radio Christian Voice		2000	1900		AM PST	UTC - 2PM EST / 1PM CST / 11	1900 l		
1900 1915 simbal	6015eu		Rwanda, Radio 6005do		1925	1915	5985af	4765af	Congo, RTV Congolaise			
1990 1900	7295af	ng	Germany, Bible Voice Broadcastin					ting	Germany, Bible Voice Broadcast Germany, Bible Voice Broadcast		1915	1900
1770 1930 1930 1770 1930 1770 1890 1730 1890 1945 1930 1945		15105af	Libya, Voice of Africa		1930	1923	15/00	7105me	Germany, Universal Life		1930	1900
15190me	6015eu 7295af	ng	Germany, Bible Voice Broadcastir		1945	1930			17705na	S		
9956eu 11970eu 11970	J	11845eu	Germany, AWR Europe		2000	1930			15190me			
1990 1956	9470me		Greece, Voice of 5865eu		2000	1930		11935af	9950eu 11620eu		1743	1700
1996 1996 North Korea, Voice of 1 1710 to 1	15630eu 7320eu		17705na	S			9585af	11980pa	New Zealand, Radio NZ Intl			
2000 Anguella, Carabbeen Beacon 1775 am 1795 2000 2000 Australia, HCIB 1716 2000	9675irr	4890do	Papua New Guinea, NBC		2000	1930			North Korea, Voice of			
1900 2000 Australia, Radio 6080pa 7240va 9500as 1930 2000 Switterland, Swiss Radio 1910 1920 2000 Canado, CRE Northern Service 425da 6070da 1920 2000 Canado, CRE Northern Service 6070da 6070da 6070da 7375am 7275as 1870am 1745as 1870am 1745as 1870am 1745as 1870am 1745as 1870am 1745as 1870am 1745as 1870am 18	6055eu		Slovakia, Radio Slovakia Intl					11775am	Anguilla, Caribbean Beacon			
1900 2000 V	11920va	9820va	Switzerland, Swiss Radio Intl		2000	1930	9500as		Australia, Radio 6080pa 9580va 9710pa		2000	
1900 2000 Canada, CRX Carroth ON Canada, CFX Toroth ON Canada, CFX Toroth ON Canada, CFX Carroth ON		9755eu	Turkey, Voice of 6055eu						Botswana, Radio 4820do	vl	2000	1900
1900 2000 Canada, CKZV St. John's NF 6160do Cate Rica, University Network 7376m 7975m	9510eu 6015eu		Germany, Bible Voice Broadcastin					6070do	Canada, CFRX Toronto ON		2000	1900
1900 2000 Costo Rica, University, Network 7725sa 11870cm 11870cm	1	15265pa			2000	195		6160do	Canada, CKZN St John's NF		2000	1900
1900 2000 Faf Cuirwie, Redio Africa 7189af 15184a 11890 2000 2015 as 1610nd. Scondinavian Weekend Radio 5990eu 2000 2020 2			HTC - 3DM FST / 2DM CST / 42E	2000			6150am 13750na	5030am	Costa Rica, University Network			
11690e	9470me				2015	2000			Eqt Guinea, Radio Africa	let a	2000	
135906	6025eu		Turkey, Voice of 6055eu	u3	2020	2000			11690eu	131 4		
1900 2000 1900 1900 2000 1900 1900 2000 1900 1900 2000 1900 1900 1900 2000 1900 1900 2000 1900 1900 2000 1900 1900 1900 2000 1900 1900 1900 1900 1900 2000 1900	6015eu 7320eu	ng	Germany, Bible Voice Broadcastin	S	2030	2000			13590af 13780af	vl		
1900 2000	15640va		Israel, Kol Israel 6280va		2030 2030	2000			Kuwait, Radio 11990va		2000 2000	1900 1900
1600 2000 Netherlands, Radio 7120d 9895d 11655d 2000 2045 2000 204	11920af		Switzerland, Swiss Radio Intl 13660af 17660af			2000			Malaysia, RTM Radio 4		2000	1900
17810af 1781	9660af	7365af	11625af						6060af			
1900 2000 Nigeria, Radio//Enugu 6025do 6050do 73810 of 7360u	17495na		USA, WBCQ Kennebunk ME		2045	2000			17810af			
1900 2000 Nigeria, Radio/Kaduna 4770do 6090do 2005 os Netherlands, Radio 15315na 17725na 2000 2000 Nigeria, Voice of 15120af 17800al 2000 2000 Nigeria, Voice of 175eu 6235eu 7335af 2000 2000 2000 Nigeria, Voice of 15120af 17800al 2000 2000 2000 Nigeria, Voice of 175eu 6235eu 7335af 2000 2000 2000 Nigeria, Voice of 17800al 2000 2100 Nigeria, Voice of 17895af 2000 2100 Nigeria, Voice of 17800al 2000 2100 Nigeria, Voice of 17850al 2000 2000 Nigeria, Voice	11655af		Netherlands, Radio 7120af	S			1/8/5na	6025do	Nigeria, Radio/Enugu	as	2000	1900
1900 2000 Nigeria, Voice of 15120af 17800al 17800al 1900 2000 1900 2000 1900 2000	17875na 9440af		Netherlands, Radio 15315na	as				4770do	Nigeria, Radio/Kaduna		2000	1900
1900 2000 2000 Sierra Leone, Radio UNAMSIL 6139af 2000 2100 2100 Australia, ABC NT Alice Springs 2310da 2000 2100 Australia, ABC NT Katherine 2485do 2000 2100 Australia, ABC NT Tennant Creek 2325do 2000 2100 Australia, Radio 9500ss 9580va 2000 2100 Australia, Radio 800spa 9500ss 9580va 2000	9680eu	13630af	9840eu 11640af	mtwhf				17800al	Nigeria, Voice of 15120af		2000	1900
900 2000 v Solomon Islands, SIBC 5020do 9545do 2000 2100 Australia, ABC NT Tennant Creek 2325do 2000 2100 Australia, Radio 9500as 9580va 11880va 12080va 12080va 11880va 12080va 12080va 11880va 12080va 12080v		11775am	Anguilla, Caribbean Beacon		2100	2000	70000.	11510af	7360eu 7290eu			
1900 2000 m South Africa, Amateur Radio League 3215af 2000 2100 2100 2100 2100 2000 2100 2100 2000 2100 2000 2100 2000 2100 2000 2100 2100 2000 2100 2100 2000 2100 2000 2100 2000 2100 2000 2100 2100 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000 2000		2485do	Australia, ABC NT Katherine		2100 2100	2000	9545do		Sierra Leone, SLBS 3316do	vl	2000	1900
1900 2000 2000 3 5 5 5 5 5 5 5 5 5	11650va	9580va	11880va 12080va		2100	2000	3215af	igue 3345af	South Africa, Channel Africa	m	2000 2000	1900
1900 2000			Australia, Voice Intl 11685as		2100 2100	2000	7275eu		South Korea, Radio Korea Intl		2000	1900
1900 2000 UK, BBC World Service 3255af 6005af 2000 2100 Canada, CFXP Calgary AB 6030do 2000 2100 Canada, CKZN St John's NF C		9625do	Canada, CBC Northern Service	vl	2100	2000			Swaziland, TWR 3200af	а	2000	1900
1900 2000 15310me 15400af 17830af 12095af 2000 2100 Contada, CKZU Vancouver BC 6160do 15310me 15400af 17830af 4319usb 5446usb 5765usb 6350usb 12579usb 13362usb 13362usb 13362usb 12133usb 12579usb 13362usb 1340a 11690eu 11690eu 13590af 15205af 1540af 15205af 15205af 1540af 15205af 1540af 15205af 1540af 13590af 13710af 15180va 13580af 13640va 13710af 15180va 17895af 15240af 15580af 2000 2100 100		6030do	Canada, CFVP Calgary AB		2100	2000		5026do	Uganda, Radio 4976do		2000	1900
1900 2000	6150am	6160do	Canada, CKZU Vancouver BC		2100	2000	12095af	9630af	6190af 6195eu 9410eu		2000	1900
1900 2000 USA, KAIJ Dallas TX 13815va 13862usb 13855usb 2000 21			7375am 9725sa		2100	2000	5446usb	4319usb	USA, Armed Forces Radio		2000	1900
1900 2000 USA, KIES Vado NM 15385na 11690eu 13590af 1900 2000 USA, KTBN Salt Lake City UT 15590na 2000 USA, Voice of America 4950af 6035af 15205af 15410af 15205af 15410af 15205af 15410af 1870va 11870va 11975af 12015va 13640va 2000 2100 2100 Germnoy, Overcomer Ministries 9755af 2000 2100 Germnoy, Overcomer Ministries 9755af 2000 2100 2000 2100 2100 2000 2100 2100 2000 2000	15184al 5990eu		Eqt Guinea, Radio Africa	lst a			13855usb		12133usb 12579usb		2000	1900
1900 2000 USA, Voice of America 4950af 6035af 7415af 9525va 9690va 9760va 9785va 2000 2100 Germnay, Overcomer Ministries 9755af 11870va 11975af 12015va 13640va 2000 2100 vl Ghana, Ghana BC Corp 3366do 13710af 15180va 15240af 15580af 2000 2100 vl Indonesia, Voice of 15150eu 17895af 17895af 2000 2100 vl Ireland, Reflections Europe 3910eu	13780af		11690eu					15385na 15590na	USA, KJES Vado NM		2000	1900
11870va			15205af 15410af		2100		6035af 9785va	4950af	USA, Voice of America 7415af 9525va 9690va			
17895af 2000 2100 s Ireland, Reflections Europe 3910eu	4915do		Ghana, Ghana BC Corp Indonesia, Voice of 15150eu	vl	2100	2000			13710af 15180va			
1900 2000 s USA, WBCQ Kennebunk ME 7415na 12255eu	6295eu	3910eu	Ireland, Reflections Europe 12255eu		2100	2000	17405	7415na	USA, WBCQ Kennebunk ME		2000	
1900 2000 mtwhfa USA, WBCQ Kennebunk ME 9330na 17495na 2000 2100 VI Italy, IRRS 5775va 1900 2000 USA, WBOH Newport NC 5920am 2000 2100 Kuwait, Radio 11990va 1000 2000 1100 2000 2100 Litria, Inc., In			Kuwait, Radio 11990va	vl	2100	2000		5920am	USA, WBOH Newport NC	mtwhta	2000	1900
1900 2000 USA, WEWN Birmingham AL 13615na 17840af 2000 2100 Latvia, Laser Radio 9290eu 1900 2000 USA, WHRA Greenbush ME 17650af 2000 2100 Liberia, ELWA 4760do 1900 2000 11SA, WHRI Nablesvilla IN 9495am 13760va 2000 2100 Melawiga PTM Padia 4 7395da		- ام 7005	Liberia, ELWA 4760do		2100	2000		17650af	USA, WHRA Greenbush ME		2000	1900
1900 2000 USA, WHRI Noblesville IN 9495am 13760va 2000 2100 Malaysia, RTM Radio 4 7295do 1900 2000 USA, WINB Red Lion PA 9930am 2000 2100 Manibia, Namibia, Namibian BC Corp 3270af 1900 2000 USA, WIE Louisville KY 7490am 11515va 6060af 6060af	3290af	3270af	Namibia, Namibian BC Corp		2100	2000		9930am	USA, WINB Red Lion PA		2000	1900
13595am 2000 2100 Nigeria, Radio/Enugu 6025do	1		New Zealand, Radio NZ Intl				1101000	/ - / / Udili			2000	1700

2000 2000 2000 2000	2100 2100 2100 2100		Nigeria, Radio/Ibadan Nigeria, Radio/Kaduna Nigeria, Radio/Lagos Nigeria, Voice of 17800af	6050do 4770do 3326do	6090do 4990do	2100 2100 2100 2100	2200 2200 2200 2200		Canada, CFRX Toronto ON Canada, CFVP Calgary AB Canada, CKZN St John's NF Canada, CKZU Vancouver BC	6070do 6030do 6160do 6160do	
2000 2000 2000	2100 2100 2100		Papua New Guinea, NBC Russia, Voice of 6145eu 7360eu	4890do 6235eu	9675irr 7290eu	2100	2200		Costa Rica, University Network 7375am 9725sa 17645as	5030am 11870am	6150am 13750na
2000 2000 2000	2100 2100 2100	vl	Sierra Leone, Radio UNAMSIL Sierra Leone, SLBS 3316do Solomon Islands, SIBC	6139af 5020do	9545do	2100 2100	2200 2200	1st f	Eqt Guinea, Radio Africa Finland, Scandinavian Weeke 11720eu	7189af nd Radio	15184al 5990eu
2000	2100	*1	South Africa, AWR Africa	15295af	75 1546	2100	2200		Germany, Deutsche Welle	9615af	13780af
2000	2100 2100		South Africa, Channel Africa Syria, Radio Damascus	3345af 12085eu	13610eu	2100		vl	15410af Ghana, Ghana BC Corp	3366do	4915do
2000 2000	2100 2100		Uganda, Radio 4976do UK, BBC World Service 6190af 6195eu 9410eu 15400af 17830af	5026do 3255af 9630af	7196do 6005af 12095af	2100 2100	2200 2200		Guyana, Voice of 5949do India, All India Radio 9575au 9910au 11715au	7410eu 9950eu	9445eu 11620va
2000	2100		USA, Armed Forces Radio 5765usb 6350usb	4319usb 7507usb	5446usb 10320usb	2100	2200	s	Ireland, Reflections Europe 12255eu	3910eu	6295eu
2000 2000	2100 2100		12133usb 12579usb USA, KAIJ Dallas TX 13815va USA, KTBN Salt Lake City UT	13362usb	13855usb	2100 2100	2200 2200		Japan, Radio 6090eu 11920va 17825na Latvia, Laser Radio 9290eu	6180eu 21670as	11855af
2000	2100		USA, Voice of America 6095va 7415af 9690va 9760va 13710af 15240af	4950af 9690va 11855af 15580af	6035af 7415af 11975af 17885af	2100 2100 2100	2200 2200 2200		Liberia, ELWA 4760do Malaysia, RTM Radio 4 Namibia, Namibian BC Corp 6060af	7295do 3270af	3290af
2000	2100		17895af USA, WBOH Newport NC	5920am	1700301	2100 2100	2200 2200		New Zealand, Radio NZ Intl Nigeria, Radio/Enugu	15265pa 6025do	
2000 2000	2100 2100		USA, WEWN Birmingham AL USA, WHRA Greenbush ME	13615na 17650as	17595af	2100 2100	2200 2200 2200		Nigeria, Radio/Ibadan Nigeria, Radio/Kaduna	6050do 4770do	6090do
2000	2100		USA, WHRI Noblesville IN	5745va	9495am	2100	2200		Nigeria, Radio/Lagos	3326do	4990do
2000 2000	2100 2100		USA, WINB Red Lion PA USA, WJIE Louisville KY	9930am 7490am	11515va	2100 2100	2200 2200		Nigeria, Voice of 17800af Papua New Guinea, NBC	4890do	9675irr
2000	2100	mtwhf	13595am USA, WMLK Bethel PA	9465eu		2100 2100	2200 2200		Russia, Voice of 6235eu Sierra Leone, Radio UNAMSIL	7290eu 6139af	7360eu
2000 2000	2100 2100	mwfs	USA, WRMI Miami FL USA, WSHB Cypress Creek SC	15725na 15665af		2100 2100	2200 2200		Sierra Leone, SLBS 3316do South Africa, Channel Africa	3345af	
2000 2000	2100 2100		USA, WTJC Newport NC USA, WWCR Nashville TN	9370na 9475na	12160na	2100 2100	2200 2200		Syria, Radio Damascus UK, BBC World Service	12085eu 3255af	13610eu 3915as
2000	2100	smtwhf	13845na 15825na USA, WWRB Manchester TN	9320na	12172na				5965as5975ca 6005af 6195va 9410eu	6110as 9605af	6190af 12095sa
2000	2100		USA, WYFR Okeechobee FL 7580eu 15195sa	3230af 15565sa	5810eu 17575sa	2100	2200		15400af USA, Armed Forces Radio	4319usb	5446usb
2000 2000 2000	2100 2100 2100	vl vl	Vanuatu, Radio 3945al Zambia, Radio Christian Voice Zimbabwe, ZBC Corp	7260do 4965do 5975do	1707000	2100	2200		5765usb 6350usb 12133usb 12579usb USA, KAIJ Dallas TX 13815va	7507usb	10320usb 13855usb
2025 2030	2045 2045		Italy, RAI Intl 5985af Thailand, Radio 9535eu	9515af	11880af	2100 2100	2200 2200		USA, KTBN Salt Lake City UT USA, Voice of America	15590na 6035af	6040va
2030 2030	2056 2057		Romania, Radio Romania Intl Vietnam, Voice of 7280eu	6110eu 9730eu	7105eu	2.00	2200		6095va 7415af 9760va 11870va	9595va 11975af	9670va 13710af
2030 2030	2059	t h		7330eu 7105eu	7210eu				15185va 15240af 17820va 17895af	15580af	17735va
2030	2100	1 11	Cuba, Radio Havana	9505eu	11760eu	2100	2200		USA, WBCQ Kennebunk ME	7415na	17495na
2030 2030	2100 2100		Egypt, Radio Cairo 15375af Sweden, Radio 6065va	9400va		2100 2100	2200 2200		USA, WBOH Newport NC USA, WEWN Birmingham AL	5920am 13615na	17595af
2030 2030	2100 2100	as	USA, Voice of America Uzbekistan, Radio Tashkent Intl 11905eu	4950af 5025eu	7185eu	2100 2100 2100	2200 2200 2200		USA, WHRA Greenbush ME USA, WHRI Noblesville IN USA, WINB Red Lion PA	17650af 5745va 9930am	9495am
2040 2045	2100 2100	mtwhfa	Armenia, Voice of 4810eu India, All India Radio	9960eu 7410eu	9445eu	2100	2200		USA, WJIE Louisville KY 13595am	7490am	11515va
2043	2100		9575au 9910au	9950eu	11620va	2100 2100	2200		USA, WRMI Miami FL	15725na	
2045	2100	. 1.5	USA, WBCQ Kennebunk ME	7415na	0000	2100	2200	asm f	USA, WSHB Cypress Creek SC USA, WSHB Cypress Creek SC	11650eu 15665af	
2045	2100	mtwhfa	USA, WBCQ Kennebunk ME 17495na	5105na	9330na	2100 2100	2200 2200		USA, WTJC Newport NC USA, WWCR Nashville TN	9370na 7465na	9475na
	2100		Vatican City, Vatican Radio 7250eu	4005eu	5890eu		2200	smtwhf	12160na 13845na USA, WWRB Manchester TN	9320na	12172na
2055	2100	DRM	Vatican City, Vatican Radio	9800eu		2100	2200		USA, WYFR Okeechobee FL 11740na 15565af	5810eu 17575sa	7580eu
		2100 (JTC - 4PM EST / 3PM CST / 1P	M PST		2100 2100	2200	vl	Vanuatu, Radio 3945al Zambia, Radio Christian Voice	7260do 4965do	
			<u> </u>			2100 2115		vl mtwhf	Zimbabwe, ZBC Corp UK, BBC World Service	5975do 5975ca	11675ca
	2110		Vatican City, Vatican Radio 7250eu	4005eu	5890eu	2115	2200		15390ca Egypt, Radio Cairo 9989eu Libya, Voice of Africa	15375af	
2100 2100	2115 2115	mtwhf	Egypt, Radio Cairo 15375af UK, BBC World Service	5975ca		2123 2130	2130 2156	vl	Libya, Voice of Africa China, China Radio Intl	15105af 5965eu	15315af 9840eu
2100 2100	2127 2130		Czech Rep, Radio Prague Intl Australia, ABC NT Katherine	5975ca 5930eu 2485do	9430va	2130 2130	2200 2200		Australia, ABC NT Katherine Australia, ABC NT Tennant Cre	5025do	70.000
2100 2100	2130 2130		Australia, ABC NT Tennant Creek China, China Radio Intl		9840eu	2130 2130 2130		t h	Relatus Radio Relatus Intl	7105eu	7210eu
			11640af 13630af			2130	2200		Guam, AWR/KSDA 11980as Iran, Voice of the Islamic Rep	12010as 9870au	11740au
2100 2100	2130 2130	vl	Cuba, Radio Havana Italy, IRRS 5775va	9505na	11760eu	2130 2130	2200	f/vI DRM	Italy, IRRS 5775va Netherlands, Radio 9800na		
2100 2100	2130 2130	mtwhf mtwhfa	Nigeria, Radio Jakada Intl USA, WBCQ Kennebunk ME	7380af 5105na	9330na	2130 2130		f	Turkey, Voice of 9525as UK, Wales Radio Intl7110eu		
2100	2130	DRM	17495na Vatican City, Vatican Radio	9800eu		2130	2200	mtwhfa	USA, WBCQ Kennebunk ME 17495na	5105na	9330na
2100 2100	2155 2156	DRM	Netherlands, Radio 11730eu North Korea, Voice of	4405as	7505eu	2130	2200		Uzbekistan, Radio Tashkent Intl 11905eu	5025eu	7185eu
2100	2159		11335eu Canada, Radio Canada Intl	5850va	7235va			8866	TO PRINTER / 45-1-46-1-4		
2100	2200		7425va 9770va Anguilla, Caribbean Beacon	9805va 11775am	13650va			2200 U	TC - 5PM EST / 4PM CST / 2	PW PST	
2100 2100	2200 2200		Australia, ABC NT Alice Springs Australia, Radio 9500as	2310do 9660pa	4835irr 11650va	2200	2220		Turkey, Voice of 9525as		
2100	2200		11880va 12080va Australia, Voice Intl 9795as	13630va	21740va	2200 2200	2228 2229		Hungary, Radio Budapest Belgium, Radio Vlaanderen Int	6025eu 11730na	11965af
2100 2100	2200 2200	vl	Austria, AWR Europe Botswana, Radio 4820do	9660af 4830al		2200	2230		Canada, Radio Canada Intl 9770va 12005va	5850va	6045va
2100	2200	ו		9625do					12000		

2200 2230	India, All India Radio 9575au 9910au 11715au	7410eu 9950eu	9445eu 11620va	2245	2300		India, All India Radio 11620as 13605as	9705as	9950as
2200 2230 2200 2230 s	Iran, Voice of the Islamic Rep Ireland, Reflections Europe	9870au 3910eu	11740au 6295eu			2300	UTC - 6PM EST / 5PM CST / 3P	M PST	
2200 2230 2200 2230 2200 2230	n 12255eu yhfas/vl Italy, IRRS 5775va Liberia, ELWA 4760do Serbia & Montenegro, Intl Radio South Korea, Radio Korea Intl twhf USA, Voice of America 11655af 11975af	6100eu 3955eu 6035af 13710af	7415af	2300 2300 2300 2300 2300 2300	0000 0000 0000 0000 0000		Anguilla, Caribbean Beacon Australia, ABC NT Alice Springs Australia, ABC NT Katherine Australia, ABC NT Tennant Creek Australia, Radio 9660pa	6090am 2310do 5025do 4910do 11695as	4835irr 12080va
2200 2240 2200 2245 2200 2256 2200 2256 2200 2300	New Zealand, Radio NZ Intl Egypt, Radio Cairo 9989eu China, China Radio Intl Romania, Radio Romania Intl 9550na 11830na Anguilla, Caribbean Beacon	15265pa 7170eu 5975eu	7250eu	2300 2300 2300 2300 2300	0000 0000 0000 0000	vl	13620as 13630as 17795va 21740va Australia, Voice Intl 13620as Botswana, Radio 4820do Canada, CBC Northern Service Canada, CFRX Toronto ON	15230as 4830al 9625do 6070do	17750as
2200 2300 2200 2300 2200 2300 2200 2300	Australia, ABC NT Alice Springs Australia, ABC NT Katherine Australia, ABC NT Tennant Creek Australia, Radio 9660va 13620va 13630va	2310do 5025do	4835irr 12080va 21740va	2300 2300 2300 2300 2300	0000 0000 0000 0000		Canada, CFVP Calgary AB Canada, CKZN St John's NF Canada, CKZU Vancouver BC Costa Rica, University Network 7375am 9725sa	6030do 6160do 6160do 5030am 11870am	6150am 13750na
2200 2300 2200 2300 vl 2200 2300 2200 2300	Australia, Voice Intl 9795as Botswana, Radio 4820do Bulgaria, Radio 5800eu Canada, CBC Northern Service	4830al 7500eu 9625do		2300 2300 2300	0000 0000 0000	1st f	17645as Cuba, Radio Havana Egypt, Radio Cairo 11725na Finland, Scandinavian Weekend	9550am Radio	5980eu
2200 2300 2200 2300	Canada, CFRX Toronto ON Canada, CFVP Calgary AB	6070do 6030do		2300	0000		11690eu Germany, Deutsche Welle 12035as	7250as	9815as
2200 2300 2200 2300 2200 2300 DI 2200 2300	Canada, CKZN St John's NF Canada, CKZU Vancouver BC RM Canada, Radio Canada Intl Costa Rica, University Network 7375am 9725sa	6160do 6160do 9800eu 5030am 11870am	6150am 13750na	2300 2300 2300 2300	0000 0000 0000	DRM vl	Germany, Deutsche Welle Ghana, Ghana BC Corp Guyana, Voice of 3291do India, All India Radio 11620as 13605as	9800as 3366do 5949do 9705as	4915do 9950as
2200 2300 2200 2300 1s		7189af Radio	15184al 5980eu	2300 2300	0000		Malaysia, RTM Radio 4 Namibia, Namibian BC Corp 6060af	7295do 3270af	3290af
2200 2300 2200 2300	11720eu Germany, Deutsche Welle Germany, Overcomer Ministries 6045na 6055na 7145ca 9480sa	6180as 5905af 6175as 9490as	6225as 5985as 7105sa 9695af	2300 2300 2300 2300	0000 0000 0000 0000		New Zealand, Radio NZ Intl Papua New Guinea, NBC Sierra Leone, Radio UNAMSIL Sierra Leone, SLBS 3316do	17675pa 4890do 6139af	9675irr
2200 2300 vl 2200 2300 2200 2300	9730as	3366do 5949do 7295do	4915do	2300 2300 2300	0000 0000 0000	vl	Singapore, Mediacorp Radio Solomon Islands, SIBC UK, BBC World Service 6035as6195va 9740as	6150do 5020do 3915as 11945as	9545do 5965as 11955as
2200 2300 2200 2300 DI 2200 2300	Namibia, Namibian BC Corp 6060af RM Netherlands, Radio 15530na Netherlands, Radio 15530eu	3270af	3290af	2300	0000		12095sa 15280as USA, Armed Forces Radio 5765usb 6350usb 12133usb 12579usb	4319usb 7507usb 13362usb	5446usb 10320usb 13855usb
2200 2300 2200 2300 2200 2300 2200 2300	Nigeria, Radio/Enugu Nigeria, Radio/Ibadan Nigeria, Radio/Kaduna Nigeria, Radio/Lagos	6025do 6050do 4770do 3326do	6090do 4990do	2300 2300 2300 2300	0000 0000 0000		USA, KAIJ Dallas TX 13815va USA, KTBN Salt Lake City UT USA, KWHR Naalehu HI USA, WBCQ Kennebunk ME 9330na	15590na 17510as 5105na	7415na
2200 2300 2200 2300 2200 2300 2200 2300 2200 2300 vl	Nigeria, Voice of 15120af Papua New Guinea, NBC Sierra Leone, Radio UNAMSIL Sierra Leone, SLBS 3316do Solomon Islands, SIBC	17800al 4890do 6139af 5020do	9675irr 9545do	2300 2300 2300 2300	0000 0000 0000 0000		USA, WBOH Newport NC USA, WEWN Birmingham AL USA, WHRA Greenbush ME USA, WHRI Noblesville IN	5920am 9975na 7580va 5745va	17595af 9495am
2200 2300 vi 2200 2300 as 2200 2300 2200 2300		9595af 9355eu 5965as	9680eu 5975ca	2300 2300	0000		USA, WINB Red Lion PA USA, WJIE Louisville KY 13595am	9320am 7490am	11515va
2200 2300 2200 2300 2200 2300	6195va 7105as 11955as 12095sa Ukraine, Radio Ukraine Intl USA, Armed Forces Radio	9605af 15400af 5840eu 4319usb 7507usb 13362usb	9740as 5446usb 10320usb 13855usb	2300 2300 2300 2300 2300 2300 2300	0000 0000 0000 0000 0000	mtwhf ws s	USA, WRMI Miami FL USA, WSHB Cypress Creek SC USA, WSHB Cypress Creek SC USA, WSHB Cypress Creek SC USA, WTJC Newport NC USA, WWBS Macon GA	15725na 15725na 7510va 15285am 9370na 11910na	
2200 2300 2200 2300 2200 2300	USA, KAIJ Dallas TX 13815va USA, KTBN Salt Lake City UT	15590na 17510as	13033080	2300	0000		USA, WWCR Nashville TN 7465na 13845na USA, WWRB Manchester TN	3210na 5050na	5070na 5085na
2200 2300 2200 2300	USA, KWHR Naalehu Hl ['] USA, Voice of America 9890va 11760va 15305va 17735va	7215va 15185va	9705va 15290va	2300	0000		6890na USA, WYFR Okeechobee FL	5985sa	11740na
2200 2300 m	15305va 17735va twhfa USA, WBCQ Kennebunk ME 9330na 17495na	17820va 5105na	7415na	2300	0000		11855sa 15170sa USA, WYFR Okeechobee FL 15170af	15400sa 5985ca	11855ca
2200 2300 2200 2300 2200 2300 2200 2300	USA, WBOH Newport NC USA, WEWN Birmingham AL USA, WHRA Greenbush ME USA, WHRI Noblesville IN	5920am 9975na 17650af 5745va	17595af 9495am	2300 2300 2300	0000 0000 2329	vl	Vanuatu, Radio 3945al Zambia, Radio Christian Voice Canada, Radio Canada Intl 11865am	7260do 4965do 5960am	9590am
2200 2300 2200 2300	USA, WINB Red Lion PA USA, WJIE Louisville KY 13595am	9930am 7490am	11515va	2300	2330 2330	w	USA, Voice of America 9780va 11735va USA, WBCQ Kennebunk ME	6180va 15150va 17495na	7205va
2200 2300 2200 2300 ws 2200 2300	USA, WRMI Miami FL s USA, WSHB Cypress Creek SC USA, WTJC Newport NC	15725na 7510eu 9370na	15285sa	2300 2300	2350 2356		Turkey, Voice of 6015va China, China Radio Intl 13680na	9655va 5990ca	6040na
2200 2300	USA, WWCR Nashville TN 9475na 13845na ntwhf USA, WWRB Manchester TN	5070na 9320na	7465na 12172na	2300	2356		Romania, Radio Romania Intl 15145au 15370au USA, WYFR Okeechobee FL	11840au 15400sa	11940au
2200 2300	USA, WYFR Okeechobee FL 21525af	7580eu 7260do	11740na	2315 2330 2330	2330 0000 0000		Croatia, Voice of 7285sa Canada, Radio Canada Intl Lithuania, Radio Vilnius	5960na 9875na	9590na
2200 2300 2205 2230 2230 2257	Vanuatu, Kadio 3945al Zambia, Radio Christian Voice Italy, RAI Intl 11895as Czech Rep, Radio Prague Intl twhfa Albania, Radio Tirana Intl	7260do 4965do 7345na 7130eu	9435af 9530eu	2330 2330 2330	0000		Switzerland, Swiss Radio Intl USA, Voice of America 7205va 9620va 11805va 13640va	9885sa 6180va 9780va 15110va	11660sa 7130va 11735va 15205va
2230 2300 m 2230 2300 f/o 2230 2300 2241 2300	occasional Italy, IRSS 5775va Sweden, Radio 6065va New Zealand, Radio NZ Intl	17675pa	, 55060	2330 2330 2330	2357 2357 2359	DRM	Czech Rep, Radio Prague Intl Vietnam, Voice of 9840as Sweden, Radio 9800na	5915na 12020as	7345na

Headnotes:

1. BBCWS stream abbreviations: (am)=Americas; (eas)=East Asia.

During the winter months, the sole **Deutsche** Welle transmission that has proven reliable in North America is the 2100 broadcast on 15410 kHz., relayed via Kigali, Rwanda and beamed toward west Africa. Listings for this broadcast are in the program guide this month.

0000 UTC / 7pm E / 4pm P - Page 45 Freqs

NEWSCASTS (*extended)

BBCWS(am) Ď... News 0000 R. Australia D... World News R. Canada Int.D... News

R. Japan D World News R. Netherlands S/MNews R. New Zealand Int. D. News Spanish Foreign R. T.A. Ibero-American News* VOA News Now T-A News & Reports*

CURRENT AFFAIRS MAGAZINES/FEATURES

R. Netherlands T.A Newsline BBCWS(am) T.A Outlook R. Canada Int. T.A As It Happens (from 2330) 0005

0006 R. Netherlands M .. Wide Angle (one topic focus)

R. Australia H... Background Briefing 0010 (documentaries) 0015

R. Japan T-A 44 Minutes 0030 R. Canada Int. H... Dispatches

BUSINESS/ECONOMICS (also in Newscasts & Current

R. Australia A ... The Business Report
R. Netherlands A ... A Good Life (development 0030

SCIENCE/TECHNOLOGY (incl. Health & Environment)

R. Canada Int.S ... Quirks & Quarks R. New Zealand Int. A. Digital Life 0005 T ... The Science Show 0010 R. Australia A ... Ockham's Razor (opinion) 0030 R. Australia R. Netherlands T ... The Research File

0034 R. Australia S ... Ockham's Razor

ARTS & CULTURE

Spanish Foreign R. M Window on Spain R. New Zealand Int. S . At the Movies 0000 0005 R. Australia M. . Awaye! (Aboriginal life/ 0010 culture)

0030 R. Netherlands M. . Vox Humana R. New Zealand Int. S . Bookmarks Spanish Foreign R. H Entremeses (food &

0035 travel)

LOCAL LIVES & VIEWS

R. Netherlands S ... Europe Unzipped (weekly 0006 review)

0010 R. Australia W.. The National Interest (politics) F Hindsight (social history)
R. Japan M Weekend Japanology

R. Netherlands S ... Insight (commentary)
R. Australia A ... Country Breakfast (rural 0125 0030 Australia)

R. Netherlands W.. EuroQuest (Europe in context) Dutch Horizons

0033 VOA News Now T-A Coast to Coast

INFORMATIONAL FEATURES

BBCWS(am) M.. Documentaries R. Netherlands S... Amsterdam Forum (topical 0006 0030 discussion) Documentary

R. Australia A ... Lingua Franca (about 0045 language)

Spanish Foreign R. T-A Spanish Language 0047 Course

0054 R. Japan M Sights & Sounds of Japan

MUSIC

WBCQ Maine A... Lost Discs Radio Show

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(7415 kHz.)
Australia S ... Keys to Music (music
R. Australia
appreciation)
R. Canada Int.M .. Global Village (world/folk)
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R. New Zealand Int. M-F Wayne's Music (nostalgia)

0010 R. Japan T-A Songs for Everyone

ENTERTAINMENT

0005

WBCQ Maine M .. Le Show 0000 BBCWS(am) S ... Pick of the World (BBC's 0006 best)

0030 R. New Zealand Int. A. Comedy Zone M .. Quiz or panel game T-A Off the Shelf (readings) BBCWS(am) 0032 0045 BBCWS(am)

SWL, MEDIA & COMMUNICATIONS

WBCQ Maine S ... Real Amateur Radio Show H Off the Hook 0000

Spanish Foreign R. S/T Radio Waves R. Bulgaria A... R. Bulgaria Calling 0045

LISTENER CONTACT/INTERACTIVE

R. Japan S Hello from Tokyo R. Australia A ... Feedback Spanish Foreign R. A Radio Club 0030 0035 0045 BBCWS(am) S ... Write On

SPORT

0023 VOA News Now T-A Sports

0100 UTC / 8pm E / 5pm P - Page 45 Freqs

NEWSCASTS (*extended) 0100 BBCWS(am) D

Ď... News China R. Int. D... News & Reports* R. Australia D... News R. Habana Cuba .. D News R. Netherlands S/M News R. New Zealand Int. D. News R. Prague D News R. Ukraine Int. D... News

VOA News Now T-A News & Reports* Voice of Vietnam ... D News VOA Spec. Eng. ... T-A News

CURRENT AFFAIRS MAGAZINES/FEATURES

R. Netherlands T-A Newsline R. Australia S ... Correspondents' Report 0105

Asia Pacific Weekend Edition
m) F ... Assignment (behind the BBCWS(am) 0106 news)

R. Netherlands M.. Wide Angle (one topic focus)

0110 China R. Int. S ... Report on Developing Countries R. Australia M-FAsia Pacific

R. Habana Cuba .. M Weekly Review
R. Austria Int. T-A Report from Austria
R. Habana Cuba .. T-S Viewpoint
VOA News Now T-A Focus (one story in depth)

R. Habana Cuba .. A Weekly Review 0140 VOA Spec. Eng. ... A In the News R. Austria Int. T-A Report from Austria VOA News Now T-F Dateline

BUSINESS/ECONOMICS (also in Newscasts & Current Affairs)

R. Prague F Economic Report 0115 Voice of Vietnam ... F Vietna China R. Int. T ... Biz China Vietnam Economy

0130 R. Netherlands A ... A Good Life (development) BBCWS(am) F ... The Music Biz VOA News Now T-F Business News 0132

0133 0140 VOA Spec. Eng. ... T Development Report

SCIENCE/TECHNOLOGY (incl. Health & Environ-

R. New Zealand Int. A. Eureka! China R. Int. A... Cutting Edge R. Australia M.. The Health Report 0105 0115 0130 R. Netherlands T ... Research File R. New Zealand Int. A. Health [or Environment] Matters

VOA News Now A Our World VOA Spec. Eng. ... W Agriculture Today 0133 0140

Health Report A Environment Report VOA Spec. Eng. ... W Science in the News 0145 Н Explorations 0150 R. Habana Cuba .. M Breakthrough

ARTS & CULTURE

BBCWS(am) W.. Masterpiece (cultural ideas)
R. Prague M Czech Books (fortnightly) 0106 0115 Α The Arts Voice of Vietnam ... W Culture & Society China R. Int. S ... In the Spotlight 0120 Voice of Vietnam ... A Literature & Arts R. Netherlands M .. Vox Humana 0130 R. Ukraine Int. M.. Roots VOA Spec. Eng. ... A American Stories H The Making of a Nation 0145

LOCAL LIVES & VIEWS

R. Austria Int. S/MInsight Central Europe R. New Zealand Int. M-F In Touch with New Zealand R. Prague S Insight Central Europe

T-A Current Affairs
Voice of Vietnam ... D Current Affairs

0106 R. Netherlands S ... Europe Unzipped (weekly review)

R. Ukraine Int. T-A Ukraine Today 0110 Voice of Vietnam ... T Vietnam: Land and People

Rural Vietnam R. Prague W Witness (oral history)
R. Prague W One on One (interview) 0115 0120

Czechs in History [or] Spotlight (places)

R. Netherlands S ... Insight (commentary) China R. Int. M .. People in the Know 0125 0130 China Horizons Н Voices from Other Lands Life in China

R. Australia A ... The Lounge (interesting people)

R. Netherlands W .. EuroQuest (Europe in context)

Dutch Horizons R. Austria Int. S/MInsight Central Europe

0135 0140 R. Habana Cuba .. T/H/F . Caribbean Outlook

0145 VOA Spec. Eng. ... T This is America Making of a Nation American Mosaic

INFORMATIONAL FEATURES

0105 R. New Zealand Int. S . Documentaries BBCWS(am) M .. Everywoman (magazine) T/H Documentaries

R. Australia T ... The Law Report
W The Religion Report 0130

R. Netherlands S ... Amsterdam Forum (topical discussion) H Documentary
VOA Spec. Eng. ... F Education Report

0140

MUSIC

0100 WBCQ Maine S ... A Different Kind of Oldies Show

0106 BBCWS(am) S ... Top of the Pops (UK music charts)

R. Ukraine Int. M .. Music from Ukraine 0110 0120

Voice of Vietnam ... S Vietnamese Music BBCWS(am) T ... The Music Feature (documentaries) Ì٨/ White Label (new music reviewed)

Н Charlie Gillett (world) John Peel (an eclectic mix) Α

ENTERTAINMENT

WBCQ Maine M.. Radio NY International (to 0400) A Allan Weiner Worldwide Voice of Vietnam ... M Sunday Show 0110 BBCWS(am) M .. Westway Omnibus (drama 0130 serial)

SWL, MEDIA & COMMUNICATIONS

0115 R. Ukraine Int. S ... Whole World on Radio

R. Australia H... The Media Report WBCQ Maine S ... World of Radio (on 9330

kHz.)	M Heading for Hungary (monthly)	
0140 R. Habana Cuba S/WDXers Unlimited LISTENER CONTACT/INTERACTIVE	T-A Hungary Today R. Canada Int.T-A Canada Today R. New Zealand Int. M-F In Touch with	0210 R. Korea Int. S Worldwide Friendship 0230 R. Sweden M In Touch with Stockholm (1st wk.)
0105 R. Prague M Mailbox 0115 Voice of Vietnam H Letterbox 0125 R. Austria Int. S/A Listener Letters	New Zealand (from 0105) R. Prague S Magazine (local color) T-A Current Affairs	R. Taiwan Int. S Mailbag Time 0235 R. Canada Int. W Maple Leaf Mailbag 0245 Voice of Vietnam H Letterbox
0130 China R. Int. A Listeners' Garden R. Ukraine Int. S Hello from Kiev	0215 R. Prague S Letter from Prague W Witness (oral history)	SPORT
0140 R. Habana Cuba M Mailbag Show 0155 R. Austria Int. S/A Listener Letters	R. Taiwan Int. S Hakka World (Hakka culture)	0200 R. New Zealand Int. S/A Live Sport (occasional)
SPORT	W Taiwan Today H Discover Taiwan	0205 BBCWS(am) H Sports International (magazine)
0105 R. Australia S/A Grandstand (live sport)* 0106 BBCWS(am) A Sports International	F Taipei Magazine 0220 R. Prague S/WOne on One (interview)	R. Australia S/A Grandstand (live sports action*)
(documentaries) 0123 VOA News Now T-A Sports Report 0130 R. Australia F The Sports Factor	0230 R. Korea Int. T Korea Today & Tomorrow W Korean Kaleidoscope (society) H Wonderful Korea (travel)	0245 R. Sweden T Sportscan (*special on 9660, 12080, 17580, 21725 kHz. only.)
0135 R. Habana Cuba T-A Time Out 0135 R. New Zealand Int. S/A Live Sport (occasional)	F Seoul Report (from the capital) R. Sweden S Network Europe (magazine-1st wk.)	0300 UTC / 10pm E / 7pm P - Page 46 Freqs
*special service on 9660, 12080, 17580, 21725 kHz.	Swéden Today (2nd wk) Studio 49 (topical discussion-4th wk.)	NEWSCASTS (*extended) 0300 BBCWS(am) S/A News
0200 UTC / 9pm E / 6pm P - Page 46 Freqs	0232 Voice of Russia S Moscow Yesterday and Today	M-F The World Today* China R. Int. D News & Reports
NEWSCASTS (*extended)	0235 R. Cana'da Int.T Media Zone (journalists' perspective)	R. Australia D News R. Habana Cuba D News
0200 BBCWS(am) D News R. Australia D News	0245 R. Sweden W. Close Up (profiles-1st wk.) F. Nordic Lights (1st wk.)	R. New Zealand Int. S/A News M-F Pacific Regional News
R. Budapest D News R. Canada Int.D News	The S-Files (things Swedish-4th wk) A Review of the Newsweek	R. Taiwan Int. D News Voice of Russia D News
R. Habana Cuba D News R. Korea Int. D News	Voice of Vietnam T Vietnam: Land & People	0330 R. Budapest D News Voice of Vietnam D News
R. New Zealand Int. D. News R. Prague D. News	A Rural Vietnam 0254 Voice of Russia H Russia: People and Events	CURRENT AFFAIRS MAGAZINES/FEATURES
R. Taiwan Int. D News Voice of Russia D News	INFORMATIONAL FEATURES	0306 BBCWS(am) S From Our Own Correspondent
0230 Voice of Vietnam D News	0205 R. New Zealand Int. S . RPM (international documentaries)	A Assignment (inside the news) 0310 China R. Int. S Report on Developing
CURRENT AFFAIRS MAGAZINES/FEATURES 0205 R. Australia A Background Briefing	0232 Voice of Russia A Christian Message from Moscow	Countries R. Habana Cuba M Weekly Review
(documentaries) 0210 R. Australia M-FThe World Today	0235 R. Habana Cuba S The World of Stamps 0245 BBCWS(am) H Heart & Soul (beliefs & values)	R. New Zealand Int. M-F Dateline Pacific
R. Korea Int. T-A News Commentary O211 Voice of Russia S News and Views M Sunday Panorama	A What's the Problem? (advice) R. Taiwan Int. M-FLet's Learn Chinese	0315 R. Habana Cuba T-S Viewpoint 0330 R. New Zealand Int. F . Pacific Correspondent
T-A Commonwealth Update 0215 R. Korea Int. T-A Seoul Calling 0230 R. Sweden T-A 60 Degrees North	MUSIC 0205 R. New Zealand Int. A. Home Grown (Kiwi	R. Sweden T-A 60 Degrees North 0332 BBCWS(am) S The Interview (ideas & trends)
0230 R. Sweden T-A 60 Degrees North BUSINESS/ECONOMICS (also in Newscasts & Current	music) 0210 R. Habana Cuba M From Habana	0340 R. Habana Cuba T/H/F . Caribbean Outlook A Weekly Review
Affairs) 0205 R. Budapest M.: Europe Unlimited (trade-	R. Korea Int. M. Korean Pop Interactive 0215 R. Prague S Encore (classical monthly)	0345 BBCWS(am) TWFA Analysis H From Our Own Correspondent
monthly) R. Canada Int.S Business Sense	Magic Carpet (world music monthly) R. Taiwan Int. M Jade Bells & Bamboo Pipes	R. Sweden A Review of the Newsweek
0215 R. Prague F Economic Report 0235 R. Canada Int. F Business Sense	(traditional) 0230 R. Habana Cuba M The Jazz Place [or] Top	BUSINESS/ECONOMICS (also in Newscasts & Current Affairs)
0245 Voice of Vietnam F Vietnam Economy	Tens R. New Zealand Int. A . Musical Chairs	0315 R. Taiwan Int. M Taiwan Economic Journal 0330 China R. Int. T Biz China
SCIENCE/TECHNOLOGY (incl. Health & Environ- ment)	(artist profile) R. Sweden M Sounds Nordic (exc. 1st wk.)	R. New Zealand Int. W Tradewinds 0332 BBCWS(am) M World Business Review
0206 BBCWS(am) T Health Matters W Go Digital	0232 BBCWS(am) W Music Review (explorations) Voice of Russia T Folk Box	T-A World Business Report 0335 R. Budapest M Europe Unlimited (trade-
H Discovery (research) F One Planet (ecology)	W Jazz Show H Musical Portraits	monthly) 0345 Voice of Vietnam F Vietnam Economy
A Science in Action 0235 R. Canada Int.S/A Sci-Tech File	F Music Around Us 0246 Voice of Russia F Music At Your Request 0250 Voice of Vietnam S Music (Vietnamese)	SCIENCE/TECHNOLOGY (incl. Health & Environ-
0245 R. Sweden F Greenscan (ecology-2nd wk.) Heartbeat (health-3rd wk.)	0250 Voice of Vietnam S Music (Vietnamese) ENTERTAINMENT	ment) 0315 China R. Int. A Cutting Edge
ARTS & CULTURE	0200 WBCQ Maine S Marion's Attic (vintage recordings)	0345 R. Sweden F Greenscan (ecology-2nd wk.) Heartbeat (health-3rd wk.)
0205 R. Budapest M Spotlight (monthly) 0206 BBCWS(am) M The Ticket (reports/	0201 BBCWS(am) S Play of the Week (radio theotre)	0350 R. Habana Cuba M Breakthrough
performances) 0215 R. Prague M Czech Books (fortnightly) A The Arts	0205 R. Australia S Margaret Throsby (interview w/music)	ARTS & CULTURE 0315 R. Taiwan Int. F Taiwan Gourmet 0320 China R. Int. S In the Spotlight
R. Taiwan Int. T Culture Express 0230 R. Sweden S Spectrum (3rd wk.)	0232 BBCWS(am) T Quiz or panel game H/A Westway (drama serial)	0320 China R. Int. 5 In the Spotlight 0330 R. Sweden S Spectrum (3rd wk.) 0335 R. Budapest M Spotlight (monthly)
0232 BBCWS(am) F The Word (considering literature)	Voice of Russia M .'. Timelines 0240 Voice of Vietnam M Sunday Show	0345 Voice of Vietnam W Culture and Society 0350 Voice of Vietnam A Literature & Arts
World Book Club (book & author) [last wk.]	SWL, MEDIA & COMMUNICATIONS	LOCAL LIVES & VIEWS
0235 R. Čanada Int.M/H Spotlight 0245 Voice of Vietnam W Culture & Society	0220 R. Budapest A DX Corner	0305 R. Australia A Rural Reporter (the outback)
0250 Voice of Vietnam A Literature and Arts	LISTENER CONTACT/INTERACTIVE 0205 R. Budapest M And the Gatepost (monthly) R. Canada Int.M Maple Leaf Mailbag	0315 R. Taiwan Int. S Hakka World (Hakka culture)
LOCAL LIVES & VIEWS 0205 R. Budapest S Insight Central Europe	R. Prague M Mailbox	H News Talk A Kaleidoscope

0320	R. Australia M-FLife Matters (Aussie social issues)	0400 UTC / 11pm E / 8pm P - Page 47 Freqs	ENTERTAINMENT 0400 WBCQ Maine S Michael Ketter Show (7415
0330	China R. Int. M People in the Know W China Horizons	NEWSCASTS (*extended)	kHz.) 0406 BBCWS(am) A Pick of the World (BBC's
	H Voices from Other Lands F Life in China	0400 BBCWS(am) S/M World Briefing* M-A News	best) 0410 R. Australia M-FMargaret Throsby (interview
	R. Sweden S Network Europe (magazine-1st wk) Sweden Today (2nd wk)	China R. Int. D News & Reports R. Australia D News R. Habana Cuba D News	w/music) 0432 Voice of Russia M Audio Book Club 0445 BBCWS(am) T-A Off the Shelf (readings)
0332	Studio 49 (topical discussion-4th wk) Voice of Russia M This is Russia T Kaleidoscope (events) H Moscow Yesterday and Today R. Budapest S Insight Central Europe	R. Netherlands S/M News R. New Zealand Int. D. News R. Prague D. News Voice of Russia D News	SWL, MEDIA & COMMUNICATIONS 0400 WWCR Tennessee S Spectrum (5070 kHz) 0430 WHRI Indiana M DXing with Cumbre (7315 kHz)
0000	M Heading for Hungary (monthly) T-A Hungary Today	CURRENT AFFAIRS MAGAZINES/FEATURES	LISTENER CONTACT/INTERACTIVE
0345	R. Sweden W Close Up (profiles - 1 st wk.) F Nordic Lights (1 st wk.) The S-Files (things Swedish-4th wk)	0400 R. Netherlands T-A Newsline 0405 R. New Zealand Int. M-F Checkpoint 0406 BBCWS(am) M Talking Point (interactive discussion)	0405 R. Prague M Mailbox 0430 China R. Int. A Listeners' Garden 0445 BBCWS(am) A Write On
	A Review of the Newsweek Voice of Vietnam T Vietnam: Land and People A Rural Vietnam	T-A Outlook (magazine) 0410 China R. Int. S Report on Developing Countries	SPORT 0400 R. Australia S/A Grandstand (live action)* (*special on 9660, 12080, 17580, 21725 kHz. only.)
0354	Voice of Russia W Russia: People & Events	BUSINESS/ECONOMICS (also in Newscasts & Current	
INFOR 0330	MATIONAL FEATURES R. Australia S All in the Mind (the brain)	Affairs) 0415 R. Prague F Economic Report 0430 China R. Int. T Biz China	0500 UTC / 12am E / 9pm P - Page 47 Freqs
0332 0345	Voice of Russia F Russian by Radio BBCWS(am) M The Instant Guide (quick background)	R. Netherlands A A Good Life (development) 0432 BBCWS(am) S Global Business	NEWSCASTS (*extended) 0500 BBCWS(am) D World Briefing* Ching R. Int. D News & Reports
	R. Taiwan Int. M-FLet's Learn Chinese	SCIENCE/TECHNOLOGY (incl. Health & Environ- ment)	R. Australia D News R. Habana Cuba D News
MUSIC 0305	R. New Zealand Int. A. Home Grown (from	0405 R. Australia S All in the Mind (the brain) 0415 China R. Int. A Cutting Edge	R. Japan D News R. New Zealand Int. D. News
0315	0205) R. Taiwan Int. T Jade Bells & Bamboo Pipes	0430 R. Netherlands T Research File	RVi, Belgium T-A News Voice of Nigeria S/A News
0330	(traditional) R. Australia S Music Deli (international) A Australian Country Style	ARTS & CULTURE 0415 R. Prague M Czech Books (fortnightly) A The Arts	Voice of Russia D News 0530 BBCWS(am) M-FThe World Today* 0545 R. New Zealand Int. M-F Pacific News
	R. New Zealand Int. M New Music Releases R. Sweden M Sounds Nordic (rock-exc. 1st	0420 China R. Int. S In the Spotlight 0430 R. Netherlands M Vox Humana	CURRENT AFFAIRS MAGAZINES/FEATURES
0332	wk.) Voice of Russia S Songs from Russia W Musical Portraits	0432 Voice of Russia W/F Russian history/culture program	0500 Voice of Nigeria M-FVON Scope 0505 R. New Zealand Int. M-F Worldwatch 0510 China R. Int. S Report on Developing
0350	Voice of Vietnam S Music (Vietnamese)	LOCAL LIVES & VIEWS	Countries
ENTER 0305	TAINMENT R. New Zealand Int. S. Sunday Drama	0405 R. Prague S Magazine (local color) T-A Current Affairs 0406 R. Netherlands S Europe Unzipped (weekly	R. Habana Cuba M Weekly Review 0515 R. Habana Cuba T-S Viewpoint R. Japan M-F44 Minutes
0332	(radio theatre) Voice of Russia A Audio Book Club	review) O410 R. New Zealand Int. A . Tagata o te Moana	0520 R. New Zealand Int. M-F Pacific Report 0530 R. New Zealand Int. M Letter from America
0340	Voice of Vietnam M Sunday Show	(Pacific magazine) 0415 R. Prague S Letter from Prague	(Alistair Cooke) 0540 R. Habana Cuba T/H/F . Caribbean Outlook
0300	MEDIA & COMMUNICATIONS WWCR Tennessee S DX Partyline (5070 kHz) KWHR Hawaii M DXing with Cumbre	W Witness (oral history) 0420 R. Prague S/W One on One (interview)	A Weekly Review
0310	R. New Zealand Int. M RNZI Talk (biweekly) Mailbox (biweekly)	H Czechs in History or Spotlight (places)	BUSINESS/ECONOMICS (also in Newscasts & Current Affairs)
0330	WHRA Maine S DXing with Cumbre (7580 kHz)	0425 R. Netherlands S Insight (commentary) 0430 China R. Int. M People in the Know W China Horizons	0511 Voice of Russia H Newmarket 0530 China R. Int. T Biz China 0545 R. Australia A Business Weekend
	WHRI Indiana M DXing with Cumbre (5745 kHz)	H Voices from Other Lands F Life in China	SCIENCE/TECHNOLOGY (incl. Health & Environ-
0240	WWCR Tennessee S World of Radio (5070 kHz) R. Habana Cuba S/WDXers Unlimited	R. Australia S The Lounge (interesting people)	ment) 0511 Voice of Russia W/A Science and
0340 0345 0350	R. Bulgaria S R. Bulgaria Calling R. Budapest A DX Corner	R. Netherlands W EuroQuest (Europe in Context) F Dutch Horizons	Engineering 0515 China R. Int. A Cutting Edge 0550 R. Habana Cuba M Breakthrough
	IER CONTACT/INTERACTIVE	0435 R. Netherlands S Europe Unzipped	· ·
0330	China R. Int. A Listeners' Garden R. Sweden M In Touch with Stockholm (1st wk.)	INFORMATIONAL FEATURES 0410 R. New Zealand Int. S . Feature on	ARTS & CULTURE 0520 China R. Int. S In the Spotlight
0335 0340	R. Taiwan Int. A Mailbag Time R. Budapest M And the Gatepost (monthly) R. Habana Cuba M Mailbag Show	religion/spirituality 0430 R. Netherlands S Amsterdam Forum (topical discussion)	UCCAL LIVES & VIEWS OSO4 RVi, Belgium T-A Flanders Today (variety magazine)
0345 0346	Voice of Vietnam H Letterbox Voice of Russia S You Write to Moscow	H Documentary 0432 Voice of Russia T/H/A 20th Century 0435 R. Habana Cuba S The World of Stamps	0505 R. New Zealand Int. S. Mana Korero (Maori magazine) 0508 RVi, Belgiam M. Tourism in Flanders 0510 R. Australia M. F. Pacific Boot (ideads)
SPORT 0300	R. Australia S/A Grandstand (live action)* R. New Zealand Int. S/A Live Sport (occasional)	MUSIC 0405 R. Australia A The Music Show 0410 R. Habana Cuba M From Habana	0510 R. Australia M-F Pacific Beat (islands magazine) 0530 China R. Int. M People in the Know W China For Other Lands
0310 0330	R. Australia M-F Regional Sports Report R. New Zealand Int. H. The World in Sport	0411 Voice of Russia S Music & Musicians 0415 R. Prague S Encore (classical monthly)	H Voices from Other Lands F Life in China P Now Zealand Let TH Today in
0335 0345	R. Habana Cuba T-A Time Out R. Sweden T Sportscan	Magic Carpet (world music monthly) 0430 R. Habana Cuba M The Jazz Place [or] Top Tens	R. New Zealand Int. T-H Today in Parliament 0532 BBCWS(am) A People & Politics
(*speci	al on 9660, 12080, 17580, 21725 kHz. only)	0440 R. New Zealand Int. S. Jazz Spotlight	(Parliament) Voice of Russia W Moscow Yesterday and Today

		11/1/	
INFORI 0505 0530	MATIONAL FEATURES R. Australia S The Europeans R. Australia S The Ark (religious history)	0620 R. Australia W Lingua Franca (about language) H The Ark (religious history) 0625 R. Japan T Let's Try Japanese	1100 UTC / 6am E / 3am P - Page 50 Freqs
0532 MUSIC 0500 0505	BBCWS(am) S Reporting Religion RVi, Belgium S Music from Flanders R. Australia A The Music Show (cont'd.) R. New Zealand Int. A. The Mix Voice of Nigeria A VON Link-Up	MUSIC 0635 R. Habana Cuba S World of Stamps MUSIC 0610 R. Habana Cuba M From Havana (Cuban musicians) R. Japan M-F Songs for Everyone	NEWSCASTS (*extended) 1100 BBCWS(am) D World Briefing* BBCWS(eas) M-A News R. Australia D News R. Japan D News R. New Zealand Int. S/A News M-F Pacific Regional News
0510 0511 0532	(requests) R. Japan S Pop Joins the World Voice of Russia S/MMusical Portraits Voice of Russia M Jazz Show T Music Around Us	A Pop Joins the World O625 R. Japan M Japan Music Treasure Box W Japan Musicscape F Music Beat (pop) O630 R. Australia A Hit Mix	1120 BBCWS(am) D British News 1130 R. Korea Int. D News CURRENT AFFAIRS MAGAZINES/FEATURES 1100 China R. Int. D Realtime Beijing
0547	H Folk Box Voice of Russia T Music At Your Request AINMENT	R. Habana Cuba M The Jazz Place [or] Top Tens 0635 R. Australia M Hit Mix T Music Deli (international)	1105 BBCWS(am) M-F Caribbean Morning Report R. Australia S Correspondents' Report M-A Asia Pacific
0500 0530	WBCQ Maine M-AAmos 'n Andy (classic comedy) Voice of Nigeria D Moving On (variety)	W Jazz Notes H Australia Country Style	1106 BBCWS(eas) M-FOutlook (magazine) 1108 R. New Zealand Int. M-F Dateline Pacific 1115 R. Japan M-FAsian Top News (region's radio)
0532 0545	Voice of Russia F Audio Book Club S/A Timelines R. New Zealand Int. M-F Storytime	ENTERTAINMENT 0600 WBCQ Maine S Juliet's Wild Kingdom 0605 R. New Zealand Int. A Saturday Night (variety)	1132 BBCWS(am) S The Instant Guide (quick background) 1145 R. Korea Int. M-FSeoul Calling
0500	EDIA & COMMUNICATIONS RVi, Belgium M Radio World WBCQ Maine S Tom & Darryl WWCR Tennessee S Cyber Line (digital)	SWL, MEDIA & COMMUNICATIONS 0600 KWHR Hawaii A DXing with Cumbre (17780 kHz)	BUSINESS/ECONOMICS (also in Newscasts & Current Affairs) 1130 R. New Zealand Int. T. Tradewinds 1132 BBCWS(am) M-FWorld Business Report
0505 0515 0530 0540	Voice of Nigeria S This Week on VON WBCQ Maine M World of Radio WHRA Maine A DXing with Cumbre (7580 kHz) R. Habana Cuba S/WDXers Unlimited	SPORT 0600 R. Australia S/A Grandstand (live action)* 0610 R. Australia M-F Regional Sports Report 0635 R. New Zealand Int. S/A Live Sport (on occasion) (*special on 9660, 12080, 17580, 21725 kHz. only.)	ARTS & CULTURE 1105 R. Australia S The Arts 1106 BBCWS(am) A The Ticket (reports/performances)
LISTEN	ER CONTACT/INTERACTIVE	<u> </u>	•
0510 0511 0514 0530 0540	R. Japan A Hello from Tokyo Voice of Russia T/F Moscow Mailbag RVi, Belgium M. Brussels 1043 China R. Int. A Listeners' Garden R. Habana Cuba M Mailbag Show	1000 UTC / 5am E / 2am P - Page 49 Freqs NEWSCASTS (*extended) 1000 BBCWS(am) S/A News	LOCAL LIVES & VIEWS 1105 R. New Zealand Int. S/A NZ Forces Radio 1115 BBCWS(am) M-F Caribbean Magazine 1130 R. Australia M-F Bush Telegraph (rural life)
SPORT 0500 0520	R. Australia S/A Grandstand (live action)* BBCWS(am) D Sports Roundup	M-F World Update* R. Australia D News R. New Zealand Int. D. News	R. New Zealand Int. H. Pacific Correspondent INFORMATIONAL FEATURES
0535	R. Habana Cuba T-A Time Out R. New Zealand Int. S/A Live Sport (on occasion) Il on 9660, 12080, 17580, 21725 kHz. only.)	CURRENT AFFAIRS MAGAZINES/FEATURES 1005 R. Australia M-F Asia Pacific A Background Briefing (documentary) 1006 BBCWS(am) S From Our Own Correspondent	1125 R. Japan T Let's Learn Japanese H Brush Up Your Japanese 1130 R. Australia A The Europeans 1132 BBCWS(eas) S Reporting Religion
0600	OUTC / 1am E / 10pm P - Page 48 Freqs	A Assignment (inside the news) 1032 BBCWS(am) A The Interview (ideas & trends)	MUSIC 1110 China R. Int. S China Beat (pop) A China Roots (traditional/folk)
NEWSC 0600	CASTS (*extended) R. Australia D News R. Habana Cuba D News R. Japan D News	1055 R. Australia A Correspondent's Notebook SCIENCE/TECHNOLOGY (incl. Health & Environment) 1030 R. Australia M Health Report	R. Japan M-F Songs for Everyone A Pop Joins the World 1125 R. Japan M Japan Music Treasure Box W Japan Musicscape F Music Beat (pop)
CUBBE	R. New Zealand Int. D. News Voice of Nigeria D News* NT AFFAIRS MAGAZINES/FEATURES	LOCAL LIVES & VIEWS 1005 R. New Zealand Int. T-H Today in	1140 R. Korea Int. S Korean Pop Interactive ENTERTAINMENT
0615 0630	Voice of Nigeria S In the News A News Maker	Parliament INFORMATIONAL FEATURES 1030 R. Australia T Law Report	1100 BBCWS(eas) S Play of the Week (radio theatre)[cont'd] 1145 BBCWS(am) M-FOff the Shelf (readings)
	CE/TECHNOLOGY (incl. Health & Environ- ment)	W Religion Report 1032 BBCWS(am) S Reporting Religion	SWL, MEDIA & COMMUNICATIONS 1130 R. New Zealand Int. M Mailbox (fortnightly)
0620 0630	R. Australia M Ockham's Razor (opinion) T In Conversation R. Australia S In Conversation	MUSIC 1005 R. Australia S Keys to Music (music appreciation)	RNZI Talk (fortnightly) LISTENER CONTACT/INTERACTIVE 1110 R. Japan S Hello From Tokyo
ARTS & 0605 0620	CULTURE R. Australia S The Arts R. Australia F The Maker	R. New Zealand Int. S . Nightcap M The Mix F Jazz A Music 'til Midnight	SPORT 1110 BBCWS(am) M-F Sports Caribbean
LOCAL 0610 0635	LIVES & VIEWS R. Japan S Weekend Japanology R. Australia F The Lounge (interesting	1010 R. New Zealand Int. T. Showtime (show music) W In a Mellow Tone H Beale Street Caravan (jazz)	1130 R. New Zealand Int. W The World in Sport F Sports Story 1132 BBCWS(am) A World Football (global soccer)
0645 0654	people) R. New Zealand Int. S. This Week in Parliament Voice of Nigeria A Window on Abuja R. Japan S Sights & Sounds of Japan	SWL, MEDIA & COMMUNICATIONS 1000 KWHR Hawaii A DXing with Cumbre (11565 kHz)	1200 UTC / 7am E / 4am P - Page 50 Freqs
	MATIONAL FEATURES R. Australia S The Europeans R. New Zealand Int. S . One in Five (disabilities)	SPORT 1030 R. Australia H Media Report SPORT 1030 R. Australia F Sports Factor	NEWSCASTS (*extended) 1200 BBCWS(am)(eas) D Newshour* R. Australia D News R. Netherlands S/A News

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				4457		
	R. New Zealand Int. S/A News M-F Late Edition*	1308	R. New Zealar Pacific	nd Int. M-F Dateline	140	00 UTC / 9am E / 6am P - Page 51 Freqs
CLIDDE	NT AFFAIRS MAGAZINES/FEATURES	1310		S Report on Developing		
1200	R. Netherlands M-F Newsline	1330	R. Sweden M-F	60 Degrees North	NEWS (CASTS (*extended) BBCWS(am) D News
1206 1210 1230	R. Netherlands S Wide Angle (one topic focus) BBCWS(am) M-F Caribbean Morning Report R. Sweden M-F 60 Degrees North	1355	commentar			BBCWS(eas) S/A News China R. Int. D News & Reports* R. Australia D News
BUSINI	ESS/ECONOMICS (also in Newscasts & Current	BUSIN	ESS/ECONOM Affairs)	ICS (also in Newscasts & Current		R. Canada Int.D News R. Japan D News
1205	Affairs) BBCWS(am) M-F Caribbean Business	1330	China R. Int. R. New Zealar	T Biz China nd Int. T . Tradewinds	1432	R. Prague D News BBCWS(eas) M-FNewshour*
1230	R. Netherlands F A Good Life (development issues)	SCIEN		OGY (incl. Health & Environ-	CURRE	ENT AFFAIRS MAGAZINES/FEATURES
SCIEN	CE/TECHNOLOGY (incl. Health & Environment)	1305	ment) R. Australia	S The Science Show	1400 1406	BBCWS(eas) M-FEast Asia Today BBCWS(am)(eas) S Talking Point
1230 1245	R. Netherlands M Research File R. Sweden H. Greenscan (ecology-2nd wk.) Heartbeat (3rd wk.)	1315 1345	R. Sweden H	A Cutting Edge Greenscan (ecology-2nd wk.) artbeat (health-3rd wk.)	1400	(interactive discussion) BBCWS(am) H Assignment (inside the news)
ARTS &	CULTURE	Arts/C	ulture	,	1410	China R. Int. S Report on Developing
1230	R. Netherlands S Vox Humana R. Sweden A Spectrum (3rd wk.)	1306 1320 1330	BBCWS(eas) China R. Int.	T Masterpiece (cultural ideas) S In the Spotlight Spectrum (3rd Sat.)	1415 1430	Countries R. Japan M-F44 Minutes R. Sweden M-F60 Degrees North
	LIVES & VIEWS R. Australia M-H Late Night Live (discussion)				BUSIN	ESS/ECONOMICS (also in Newscasts & Current
1205	R. New Zealand Int.A NZ Forces Radio ′	1330	LIVES & VIEWS China R. Int.	M People in the Know	1410	Affairs) China R. Int. T Biz China
1206	R. Netherlands A Europe Unzipped (weekly review)			na Horizons ces from Other Lands	1415 1432	R. Prague W Economic Report BBCWS(am) H The Music Biz
1225	R. Netherlands A Insight (commentary) BBCWS(am) M-F Caribbean Magazine		R. New Zealar	in China nd Int. H. Pacific Correspon-		CE/TECHNOLOGY (incl. Health & Environ-
1230	R. Netherlands T EuroQuest (Europe in context)			Network Europe (magazine-1st	1415	ment) China R. Int. A Cutting Edge
	H Dutch Horizons R. Sweden A Network Europe (magazine-1st wk.)		Stuc	eden Today (2nd wk.) dio 49 (discussion-4th wk.)	1445	R. Sweden H Greenscan (ecology-2nd wk.) Heartbeat (health-3rd wk.)
	Sweden Today (2nd) Studio 49 (discussion-4th)	1345	R. Sweden T	Close Up (profiles - 1st wk.) rdic Lights (1st wk.)		CULTURE
1245	R. Sweden T Close-Up (profiles-1st wk)		The	S-Files (things Swedish-4th wk.)	1405 1406	R. Australia S Books & Writing BBCWS(am) M Masterpiece (cultural ideas)
	H Nordic Lights (1st) The S-Files (things Swedish-4th)			iew of the Newsweek	1415	R. Prague F The Arts A Czech Books (fortnightly)
	F Review of the Newsweek	1306	MATIONAL FEA BBCWS(am)	S Documentaries	1420 1430	China R. Int. S In the Spotlight R. Sweden S Spectrum (3rd wk.)
INFOR 1205	MATIONAL FEATURES R. Australia S The Spirit of Things (spiritual	1332	BBCWS(eas) BBCWS(am)	M/W Documentaries S In Praise of God (worship		
1230	matters) R. Netherlands W Documentary		service) BBCWS(eas)	S Reporting Religion	1405	L LIVES & VIEWS R. Canada Int.S The Sunday Edition
1200	A Amsterdam Forum (topical discussion)	MUSIC	, ,	5 Reporting Religion		(interviews/documentaries) M-F Sounds Like Canada
MUSIC		MUSIC 1301	BBCWS(eas)	A In Concert (classical		A The House (Parliament) R. Prague M-F Current Affairs
1205	R. Australia F Sound Quality (innovative) A The Music Show	1305	recitals) R. Australia	S The Music Show (from	1410	A Insight Central Europe R. Japan A Weekend Japanology
1230	R. Sweden S Sounds Nordic (rock-exc. 1st wk.)		1205) M-F The	Planet (international)	1415	R. Prague T Witness (oral history)
ENTER 1205	TAINMENT BBCWS(eas) A Quote, Unquote (or other	1308	R. New Zealar (nostalgia)		1420	R. Prague T One on One (interview) W Czechs in History [or] Spotlight
1205	game/quiz)	1000	A Nev	v Music Releases	1430	(places) China R. Int. M People in the Know
	MEDIA & COMMUNICATIONS	1330	R. Sweden S	nd Int. A . Hymns Sounds Nordic (rock/pop-exc.		W China Horizons H Voices from Other Lands
1230	HCJB Ecuador A DX Partyline		1 st wk.)			F Life in China R. Canada Int.W C'est la Vie (French
LISTEN 1230	ER CONTACT/INTERACTIVE R. Sweden S In Touch with Stockholm (1 st wk.)	ENTER 1306	TAINMENT BBCWS(am)	A Pick of the World (BBC's		Canada)
SPORT		1345	best)	M-F Off the Shelf (readings)		R. Sweden A Network Europe (Europe magazine-1st wk.)
1205	R. New Zealand Int.S Sportsworld (weekend		, ,	, ,,,		Sweden Today (2nd wk.) Studio 49 (discussion-4th wk.)
1245	review) R. Sweden M Sportscan	1330	MEDIA & COMN R. New Zealar (fortnightly)		1445	R. Sweden T Close Up (profiles-1st wk.) H Nordic Lights (1st wk.) The S-Files (things Swedish-4th wk.)
130	00 UTC / 8am E / 5am P - Page 51 Freqs			ZI Talk (fortnightly) A DXing with Cumbre (15105	1454	F Review of the Newsweek R. Japan A Sights & Sounds of Japan
NEWS		LISTEN	IER CONTACT/	INTERACTIVE		MATIONAL FEATURES
1300	BBCWS(am)(eas) D News China R. Int. D News & Reports* R. Australia D News	1330	China R. Int. R. Sweden S	A Listeners' Garden In Touch with Stockholm (1 st	1405 1406	R. Australia A The Comfort Zone (design & ritual) BBCWS(am) M/W Documentaries
	R. Canada Int.M-FNews R. New Zealand Int. S/A News	1345	wk.) BBCWS(am)	A Write On	MUSIC	
1330	M-F Pacific Regional News	SPORT			1405	R. Japan S Pop Joins the World
1332	BBCWS(eas) M-FBritish News	1310 1330		M-F Regional Sports Report ad Int. W The World in Sport	1430	R. Sweden S Sounds Nordic (rock/pop- exc.1st wk.)
1305	R. Canada Int.M-FThe Current		F Spo	rts Story	1432	BBCWS(am) M The Music Feature (documentaries)
1306	BBCWS(am) M-FOutlook BBCWS(eas) S From Our Own Correspon-	1345	F Éoo	M-H Sports Roundup		T White Label (new music reviewed) W Charlie Gillett (world)
	dent H Assignment (inside the news)		R. Sweden M	Sportscan		F John Peel (eclectic mix)

ENTERTAINMENT LISTENER CONTACT/INTERACTIVE 1405 R. Australia M-F Margaret Throsby (interview w/music) SPORT DOCUMENTAGES LISTENER CONTACT/INTERACTIVE R. Prague S Mailbox China R. Int. A ... Listeners' Garden R. Sweden S In Touch with Stockholm (1st wk.) SPORT BBCWS(am) F ... Sports International 1406

1500 UTC / 10am E / 7am P - Page 52 Fregs

BBCWS(am)(eas) A Sportsworld (live

NEWSC 1500	CASTS BBCWS(am)(eas) D China R. Int. D Ne R. Australia D Ne R. Canada Int.D Ne	ews ews
CLIBBE	NIT ACCAIDS MACAZIN	IEC/EE

(documentaries)

R. Sweden M Sportscan

action)

1445

CURRE	NT AFFAIRS N	1AG/	AZINES/FEATURES
1505	R. Australia	M-	F Asia Pacific
1506	BBCWS(am)	S .	Assignment (inside the
	news)		
	DDC\\/S/ama\	С	D

1510	BBCWS(eas) China R. Int. Countries	S Documentaries S Report on Developing
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BUSINESS/FINANCE	(also in	Newscasts	& Current
Affairs)			

	Allulis	
1530	China R. Int.	T Biz China
1555	R. Australia	S Business Weekend

SCIEN	CE/TECHNOLOGY (i	ncl. Health & Environ.)
1506	BBCWS(am)(eas) N	1 Health Matters
	T Go Digital	

	1 60	Digital
	W Dis	covery (research)
	H On	ie Planet (ecology)
	F Sci	ence in Action (magazine
1515	China R. Int.	A Cutting Edge
1530	R. Australia	M The Health Report

ARTS & CHITTIRE

1520	China R. Int. S In the Spotlight
1532	BBCWS(am)(eas) H The Word (considering
	literature)
	World Book Club (book &
	author)[last wk.]

LOCAL LIVES & VIEWS

1505	R. Canada Int.S The Sunday Edition (trom
	1405)
	M-F´ Sounds Like Canada
1530	China R. Int. M People in the Know
	W China Harizans

Voices from Other Lands Life in China

BBCWS(am)(eas) S 1532 People & Politics (Parliament)

INFORMATIONAL FEATURES

1505	R. Australia S	Encounter (spiritual beliefs
1530	R. Australia T	Law Report
	W Religi	on Report
1545	BBCWS(am)(eas)	W Heart & Soul (beliefs &
	F What	's the Problem (advice)
	R. Canada Int. N	Λ-Η Out Front (first person
	views)	

MUSIC

1505	R. Australia millenia)	A Nocturne (music of the
1532	BBCWS(am)	T Music Review (explorations

ENTERTAINMENT

1505	R. Canada Int.A Vinyl Cafe (music/humor)
1532	BBCWS(am)(eas) M Quiz or panel game
	W/F Westway (drama serial)

SWL, MEDIA & COMMUNICATIONS

R. Australia H... The Media Report

1530 China R. Int. A Listeners' Garden	1530	China R. Int.	A Listeners' Garder	٦
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SPORT			
1505	BBCWS(am)(e	as) A	Sportsworld (from
	1405)		
1530	R. Australia	F The	Sports Factor

1600 UTC / 11am E / 8am P - Page 52 Fregs

NEWS	CASTS (*extend	led)	
1600		S-F World Briefing	*
	A Ne	ws.	
	R. Australia	D News	
	R. Canada Ir	t.S/A News	
1620	BBCWS(am)	S-F British News	

CURRENT AFFAIRS MAGAZINES/FEATURES

013	N. AUSITIU IIII.	MI-I REPORTITORI AUSTRA
645	BBCWS(am) S	The Instant Guide (quick
	background)
	M/T/H/F	Analysis
	W From	m Our Own Corresponder
415	D A akri a lak	NA E Danant franco A. Latrica

	W Fr	om Our Own Corresponder
1645	R. Austria Int.	M-F Report from Austria

BUSINESS/ECONOMICS (also in Newscasts & Current

	Aliairs)	
1632	BBCWS(am) S	World Business Review
	M-F Wo	orld Business Report

SCIENCE/TECHNOLOGY (incl. Health & Environment) 1605 R. Canada Int. A ... Quirks and Quarks

LOCAL LIVES & VIEWS

1605	R. Australia S The National Interest
	M-F Bush Telegraph (rural life)
	R. Austria Int. S/A Insight Central Europe
	R. Canada Int. S The Sunday Edition (from
	1405)

1635 R. Austria Int. S/A Insight Central Europe

INFORMATIONAL FEATURES

R. Australia The Comfort Zone (homes/ 1605 gardens/food)

R. Australia A Nocturne (from 1505)

SWL, MEDIA & COMMUNICATIONS

1600	KWHR Hawaii	A DXing with Cumbre (9930
	kHz)	-
	WHRI Índiana	A DXing with Cumbre (13760
	kHz)	

LISTENER CONTACT/INTERACTIVE

	1=11 001 111 101/1		
1625	R. Austria Int.	S/A	Listener Letters
1655	R. Austria Int.	S/A	Listener Letters

SPORT

1606	BBCWS(am)	S/A Sportsworld (live action)
1640	BBCWS(am)	M-F Sports Roundup

1700 UTC / 12pm E / 9am P - Page 53 Freqs

NEWSCASTS (*extended) R. Australia D News R. Japan D News 1700

CURRENT AFFAIRS MAGAZINES/FEATURES

1700	R. Africa Int.	D Reports, features, music
1715	R. Japan M-F	44 Minutes

LOCAL LIVES & VIEWS

R. Australia M-F Australia Talks Back (national call-

INFORMATIONAL FEATURES

R. Australia A The Spirit of Things (spiritual matters)

MUSIC

1705		Sound Quality (innovative)
1710	R. Japan M-F	Songs for Everyone
	A Pop	Joins the World
1730	VOA Africa S	Music Time in Africa

LISTENER CONTACT/INTERACTIVE

1706	VOA	Africa M-F	Talk to America	(listener phone-in)

1710 R. Japan S Hello from Tokyo

1900 UTC / 2pm E / 11am P - Page 54 Freqs

NEWSCASTS

1900	R. AustraliaD	New	/S
1930	R. Netherlands	S/A	New

CURRENT AFFAIRS MAGAZINES/FEATURES

1933	VOA News Now F News Review
1936	R. Netherlands S Wide Angle (one topic focus

BUSINESS/ECONOMICS (also in Newscasts & Current Affairs)

R. Australia A The Business Report

SCIENCE/TECHNOLOGY (incl. Health & Environment)

R. Australia A Earthbeat (environment) 1905

ARTS & CULTURE

R. Netherlands A... Vox Humana

LOCAL LIVES & VIEWS

1905		Rural Reporter
1910	R. AustraliaS-H	Pacific Beat (islands magazine)
1936	R. Netherlands	A Europe Unzipped (weekly
	review)	
1955	R. Netherlands	A Insight (commentary)

INFORMATIONAL FEATURES

R. Netherlands S ... Documentary 1900

MUSIC

1110010		
1905	VOA News Nov	w M-F Border Crossings
1930	R Australia F	Australian Country Style

SPORT

R. AustraliaS-H Sport 1929

2000 UTC / 3pm E / 12pm P - Page 54 Freqs

NEWSCASTS

R. Netherlands S/A News 2030

Current Affairs Magazine/Features

R. Netherlands S ... Wide Angle (one topic focus)

SCIENCE/TECHNOLOGY (incl. Health & Environment)

R. AustraliaF 2030 The Buzz (technology)

ARTS & CULTURE

R. Netherlands S ... Vox Humana

LOCAL LIVES & VIEWS

2005	R. AustraliaF	
	A Aus	tralia All Over (nationwide)
2010	R. AustraliaS-H	Pacific Beat (islands magazine)
2036	R. Netherlands	A Europe Unzipped (weekly
	review)	

INFORMATIONAL FEATURES

R. Netherlands A... Amsterdam Forum (topical discussion)

SPORT

R. AustraliaS-H Sport

2100 UTC / 4pm E / 1pm P - Page 55 Freqs

NEWSCASTS (*extended) 2100 BBCWS(am) D... Newshour* Deutsche Welle D... News R. AustraliaD News R. Japan D News R. Prague D News

CURRENT AFFAIRS MAGAZINES/FEATURES

2105	Deutsche Welle	M-F Newslink Africa
2110	R. AustraliaS-H	AM (morning news magazine)
2115	R. Japan M-F	Asian Top News (region's radio)

2133 VOA News Now S On the Line (US foreign policy)	H One Planet (ecology) F Science in Action (magazine)	2345 R. Prague H Economic Report
BUSINESS/ECONOMICS (also in Newscasts & Current	ARTS & CULTURE	SCIENCE/TECHNOLOGY (incl. Health & Environment) 2305 R. Australia A All in the Mind (the brain)
Affairs) 2130 R. AustraliaT Innovations (new products)	2232 BBCWS(am) H The Word (considering literature)	2315 China R. Int. F Cutting Edge 2330 R. AustraliaH The Buzz (technology)
SCIENCE/TECHNOLOGY (incl. Health & Environment)	World Book Club (book & author)[last wk.]	ARTS & CULTURE
2130 R. AustraliaM Earthbeat (environment) H All in the Mind (the brain) F In Conversation	2245 R. Prague S Czech Books (fortnightly) F The Arts	2320 China R. Int. A In the Spotlight 2330 R. Australia W The Arts 2345 R. Prague F The Arts
2133 VOA News Now A Our World	LOCAL LIVES & VIEWS	A Czech Books (fortnightly)
ARTS & CULTURE	2204 RVi Belgium M-F Flanders Today (variety magazine)	LOCAL LIVES & VIEWS
2115 R. Prague S Czech Books (fortnightly)	2208 RVi Belgium S Tourism in Flanders	2312 R. New Zealand Int. F Focus on Politics
2130 Deutsche Welle T Arts on the Air H Cool (youth culture)	2235 R. Prague S Letter from Prague M-F Newsview	A This Week in Parliament 2330 China R. Int. S People in the Know
LOCAL LIVES & VIEWS	A Insight Central Europe 2240 R. AustraliaS Australia Wide (national news)	T China Horizons W Voices from Other Lands
2105 R. Australia A Australia All Over (from 2005) R. Prague M-F Current Affairs	2245 R. Prague T Witness (oral history) A Letter from Prague	H Life in China R. AustraliaT Rural Reporter (outback)
A Magazine (local color) 2110 R. Japan A Weekend Japanology	2250 R. Prague M. Talking Point (Czech issues) T/A. One on One (interview)	R. New Zealand Int. A Spectrum (life in NZ) 2335 R. Prague S Letter from Prague
2115 BBCWS(am) M-F Caribbean Report* R. Prague T Witness (oral history)	W Czechs in History [or] Spotlight (places)	M-F Newsview A Magazine
A Letter from Prague	INFORMATIONAL FEATURES	2345 R. Prague A Letter from Prague
2120 R. Prague M. Talking Point T/A One on One (interview) W. Czechs in History [or] Spotlight (places)	2206 BBCWS(am) S Documentaries 2232 BBCWS(am) S In Praise of God (worship service)	T Witness (oral history) 2350 R. Prague T/A One on One (interview) W Czechs in History [or] Spotlight (places)
2130 BBCWS(am) T/F Calling the Falklands ^	2245 BBCWS(am) W Heart & Soul (beliefs &	Control of the contro
Deutsche Welle W Living in Germany R. AustraliaS Country Breakfast (rural issues) H Rural Reporter	values) F What's the Problem? (advice)	INFORMATIONAL FEATURES 2330 R. AustraliaM The Europeans
2145 Deutsche Welle W., Europe in CAPITALS	MUSIC	MUSIC
2154 R. Japan A Sights & Sounds of Japan	2200 RVi Belgium A Music from Flanders	2330 R. AustraliaF Hit Mix
(*special service on 5975, 6135, 11675, 15390 kHz. only.) (^special service on 11680 kHz.)	2232 BBCWS(am) T Music Review (explorations) 2230 R. Australia A Music Deli (international)	R. New Zealand Int. F The Sampler (latest CDs) 2345 R. Prague A Encore (classical-monthly) Magic Carpet (world-monthly)
INFORMATIONAL FEATURES	ENTERTAINMENT	
2105 Deutsche Welle S Religion & Society 2115 Deutsche Welle S Inspired Minds	2200 WBCQ(7415kHz) S Radio Free Euphoria M Jean Shepherd	ENTERTAINMENT 2300 WBCQ Maine A Radio Timtron Worldwide
A German by Radio	F Pan Global Wireless	2300 WBCQ Maine A Radio fiffifiori Worldwide
R. Japan T Let's Learn Japanese H Brush Up Your Japanese	2201 BBCWS(am) A Play of the Week (radio	2330 R. Canada Int. A Madly Off in All Directions
H Brush Up Your Japanese MUSIC	theatre) 2230 WBCQ(7415kHz) F The Pab Sungenis Project	(comedy/satire) WBCQ Maine H Uncle Ed's Musical Memories F WDCD
2105 VOA News Now M American Gold (oldies)	2232 BBCWS(am) M Quiz or panel game	
T Roots & Branches (folk) W Classic Rock	W/F Westway (drama serial)	SWL, MEDIA & COMMUNICATIONS 2300 WBCQ Maine W World of Radio
H Top 20	SWL, MEDIA & COMMUNICATIONS	2330 WHRI Indiana A DXing with Cumbre (9495
F Country Hits	2200 RVi Belgium S Radio World	kHz)
2110 R. Japan S Pop Joins the World M-F Songs for Everyone	WHRA Maine F DXing with Cumbre (17650 kHz)	LISTENER CONTACT/INTERACTIVE
2115 R. Prague A Encore (classical-monthly) Magic Carpet (world-monthly)	WHRI Índiana S DXing with Cumbre (5745 kHz)	2330 China R. Int. F Listeners' Garden 2340 R. Prague S. Mailbox
2125 R. Japan M Japan Music Treasure Box W Japan Musicscapes	2230 WHRA Maine A DXing with Cumbre (17650 kHz)	SPORT
F Music Beat 2130 Deutsche Welle S Hits in Germany [or]	LISTENER CONTACT/INTERACTIVE	2330 R. Canada Int. S The Inside Track
Melody Time	2214 RVi Belgium S Brussels 1043	
M A World of Music F Focus on Folk	2235 R. Prague S Mailbox	Thank You
	2700 HTC / Come E / Tome B. Boss EC Frome	I HUNK YOU
SWL, MEDIA & COMMUNICATIONS	2300 UTC / 6pm E / 3pm P - Page 56 Freqs	Additional Contributors to This

CASTS (*extended)
BBCWS(am) D The World Today*
China R. Int. D News & Reports*
R. Australia D News
R. Canada Int. M-F The World at Six*
R. New Zealand Int. S-H Midday Report*
F/A News
R. Prague D News
NT AFFAIRS MAGAZINES/FEATURES
R. Canada Int. S/A The World This Weekend
China R. Int. A Report on Developing
Countries
R. Australia S-H Asia Pacific

BBCWS(am) A ... The Interview (ideas & trends) BUSINESS/ECONOMICS (also in Newscasts & Current

BBCWS(am)

2230 R. Australia F AM Saturday Affairs) SCIENCE/TECHNOLOGY (incl. Health & Environment) China R. Int. M .. Biz China M .. Health Matters The Business Report R. AustraliaS Innovations

2330

2332

2332

BBCWS(am) M
Go Digital 2206 Discovery (research)

WWCR Tennessee H DX Partyline

2200 UTC / 5pm E / 2pm P - Page 55 Freqs

D... News

M-F News

News

News

CURRENT AFFAIRS MAGAZINES/FEATURES

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MONITORING TIMES

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Monitoring Military Flight Demonstration Groups

- Our Annual Frequency, Equipment, and Schedule Report

here is nothing quite as thrilling as going to one of the many public air shows across the country and watching the Blue Angels or Thunderbirds flight demonstration team strut their stuff in front of thousands of fans. But if you add to the visual drama in front of you the element of monitoring the team's radio communication, you will have a whole new perspective that few get to enjoy.

Since the 2004 air show season starts this month, in this edition of *Milcom* we will present our annual frequencies to monitor, review of equipment, and the military flight demonstration team schedules (Table One) for the upcoming 2004 air show season.

So where is the action?

You will need to concentrate on several different bands for air show activity. Search the following bands in the modes indicated:

118.0-137.0 MHz	AM mode (AM)	25 kHz steps
122.7-123.575 MHz	AM	25 kHz steps
138.0-144.0 MHz	AM/Narrowband FM (NBFM)	12.5 kHz steps
148.0-150.8 MHz	AM/NBFM	12.5 kHz steps
225.0-389.0 MHz	AM	25 kHz steps
389.0-400.0 MHz	AM/NBFM	25 kHz steps
406.1-420.0 MHz	NBFM	12.5 kHz steps

U.S. Military Flight Demonstration Teams

The U.S. Navy (USN)/Marine Corps (USMC) team is represented on the air show circuit by the Blue Angels flying their F/A-18 Hornet aircraft. The other major piece of hardware in the squadron is their C-130 Hercules transport aircraft, affectionately known as Fat Albert. It is the only Marine Corps aircraft permanently assigned to support a Navy squadron and is flown by an all-Marine Corps crew of three pilots and five enlisted personnel. Fat Albert flies more than 140,000 miles during the course of a show season.

The following discrete frequencies have been reported in use by the U.S. Navy Blue Angels during the past six air show seasons. An * indicates a frequency that has not been reported recently and may no longer be in use.

U.S. Navy Blue Angels

U.S. Navy B	lue Angels
Frequency	Usage
142.000*	Ground Comm Cart/Ground maintenance personnel (NBFM)
143.000*	Tower observer (AM)
143.600	Ground support, occasional BA air-to-air during cross country trips (AM)
164.900	Ground Comm Cart/Ground maintenance personnel (NBFM)
168.900	Ground Comm Cart/Ground maintenance personnel (NBFM)
169.400*	Ground Comm Cart/Ground maintenance personnel (NBFM)
170.900	Ground Comm Cart/Ground maintenance personnel (NBFM)
236.450	Fat Albert (C-130 transport) aircraft (AM)
238.150	Taxi Out (Aircraft 1/2)/Show center/Diamond formation aircraft (1-4)/Commonly reported air-to-air enroute (AM)
251.600*	Solo aircraft (5/6) air-to-air (AM)
256.250*	Usage unknown (AM) Note: Reported at a Texas airshow.
263.350	Diamond formation aircraft (1-4)/Fat Albert (C-130 transport) aircraft JATO flight demonstration (AM)
0/0 500	F . All . C 100 : (. (ALA)

275.350	Note: Last heard at Dayton Air Show. Taxi Out (Aircraft 3/4)/Diamond formation aircraft (1-4)
273.330	air-to-air and all six aircraft air-to-air (AM) [Channel 9]
286.000*	Usage unknown (AM) Note: Reported at two Texas airshows.
302.150	Miscellaneous air-to-air (AM) Note: Reported on the west coast.
307.700	Show center/Diamond formation aircraft (1-4) (AM) Note: Reported on west coast.
345.900	Taxi out (Aircraft 5/6)/Solo aircraft (5/6) air-to-air (AM)

The premier U.S. Air Force (USAF) flight demonstration team is known as the Thunderbirds. This team uses a mix of six aircraft, performing formation flying and solo routines. The four-aircraft diamond formation demonstrates the training and precision of Air Force pilots, while the solos highlight the maximum capabilities of the Lockheed Martin F-16 Fighting Falcon. The pilots perform approximately 30 maneuvers in a demonstration. The entire show, including ground and air, runs about an

hour and 15 minutes.

The list below has frequencies reportedly used by the Thunderbirds during the last six air show seasons. It should be noted that at some shows 143.850 and 235.250 MHz roles get reversed from what is published below. An * indicates a frequency that has not been reported recently and may no longer be in use.

USAF Thunderbirds

Special Flight Demonstration Teams

Frequency	Usage
140.400*	Support aircraft and show aircraft cross country air-to-air (AM)
141.850	Pre-take off checklist/Four ship formation air-to-air which is linked to public address system (AM) [Victor 1]
143.850	Four, five and six aircraft on/off show center (AM) [Victor 2]
235.250	Solo aircraft on/off show center (AM)
322.950	Engine Starts/Solo aircraft (5-6) air-to-air (AM)
413.000	Maintenance/ground teams (NBFM) Digital comms
413.025	Maintenance crews/ground teams (NBFM) Analog and digital comms
413.100	Maintenance/ground teams (NBFM) Analog and digital comms
413.250	Maintenance/ground teams (NBFM) Analog comms
413.275	Maintenance/crew chiefs (NBFM) Analog comms
413.350	Maintenance/ground teams (NBFM) Digital comms
413.375	Maintenance/ground teams (NBFM) Digital comms

Both the Navy and the Air Force have other special flight demonstration units in addition to those units mentioned above. Listings below transmit in the AM mode. Here is a list of those units and their frequencies.

USAF ACC A-10 Thunderbolt demonstration teams
123.150 123.475 269.900 384.550
East: 347FW/23FG Pope AFB, NC
139.625 139.975 140.400 236.850 343.000
West: 355FW Davis Monthan AFB, AZ
123.475 138.050 138.100 138.200 138.250 138.300
138.475 138.500 139.625 139.725 139.800 142.200
123.475 305.400 327.700
USAF ACC F-15 Eagle demonstration teams
276.675 376.025 384.500 384.550 384.850
East: 1FW/1OG Langley AFB, VA
225.650 228.450 228.950 233.525 236.550 238.625
238.825 252.775 257.075 262.025 262.050 264.975
275.675 279.650 282.675 282.800 285.150 287.775

263.500

Fat Albert C-130 aircraft (AM)

Diamond aircraft (1-4)/Solo aircraft (5-6) formations (AM)

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296.925 298.350 301.525 305.650 315.125 315.850 317.800 319.325 325.325 325.725 325.775 333.550
    359.225 364.125 385.700 391.200 396.900 397.100
   West: 33FW Eglin AFB, FL
   232.150 234.600 236.150 237.400 239.400 252.525 252.575 254.675 258.375 259.550 260.275 264.875
    266.550 268.175 292.725 303.950 330.125 333.550 338.750 351.050 355.750 384.550 399.750 399.850
USAF ACC F-16 Fighting Falcon demonstration teams
   East: 20FW/78FS Shaw AFB
   138.025 138.100 138.200 138.250 138.475 138.425
     138.900 139.750 139.825 139.900 139.925 139.975
     140.375 141.600 229.075 261.200 336.925 344.900
   West: 388FW/4FS Hill AFB
   138.025 138.100 138.200 138.250 317.800
USN VF-101 F-14 flight demonstration team
   261.100 299.500 311.500 341.200 342.900 342.950
     345,000
USAF Combat search and rescue demonstrations
   139.700 225.450 236.000 242.000 251.900 252.800
     259.000 280.500 282.800 381.000
USN Search and Rescue demonstrations
   242.500 282.000 283.100
US Coast Guard aircraft demonstrations
   122.900 (SAR) 157.050 (Drug Interdiction demo) 381.700 (SAR)
    381.800 (SAR) 383.9 (SAR)
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Military Parachute Teams

The colorful U.S. Navy Seal Parachute Team, known as the Leap Frogs, are frequent visitors around the country at various sporting events and air shows. This team has been regularly reported on their 407.500 MHz (NBFM) frequency nationwide the last several years. Last year we got a report of team communications on 134.100 and 270.000 MHz (AM).

The U.S. Army Parachute Team is known as the Golden Knights. They also make the rounds during the air show season. Look for their communications on 123.400, 123.475 or 123.500 MHz. You should also keep 32.300, 32.400, 122.575, 124.875, 284.900 and 367.700 MHz plugged in for possible GK activity.

During 2001 and 2002 seasons I received several reports that the Golden Knights were using civilian UHF frequencies (such as 462.625 MHz, a business itinerant frequency known as Black Dot) and two FRS frequencies: 467.5625, and 467.6125 MHz. These reports suggest that the Golden Knights might be using Family Radio Service radios. It might be a good idea to keep FRS frequencies in your scanner since you might hear some interesting activity on these frequencies anyway during air shows. The standard FRS frequencies are (NBFM mode):

Family Radio Service 462.5625 Channel 1 462.5875 Channel 2 462.6125 Channel 3 462.6375 Channel 4 462.6625 Channel 5 462.6875 Channel 6 462.7125 Channel 7 467.5625 Channel 8 467.5875 Channel 9 467.6125 Channel 10 467.6375 Channel 11 467.6625 Channel 12 467.6875 467.7125 Channel 13 Channel 14

We did receive a report of the ground pyrotechnics personnel from the Tora Tora Tora and Warbirds flight demonstration team using FRS radios for communications during one show last year. You will also find other military monitoring enthusiasts who use FRS radios at the show to meet fellow enthusiasts. Load them up in your scanner and you might make a new Milcom friend or two.

One final note regarding military UHF frequencies. The government's version of the Family Radio Service is known as the Inter-Squad Radio or ISR. I have seen a couple of scattered reports over the last couple of years that these radios might be in use at air shows by military units. At this point it might be a good idea to program these frequencies in also as part of your air show loadout. As always, field reports are requested.

Inter-Squad Radio 396.8750 Channel 1 397.1250 Channel 2 397.3750 397.4750 397.1750 Channel 3 Channel 4 397.4250 Channel 5 Channel 6 397.5500 397.9500 Channel 7 Channel 8 399.4250 398.0500 Channel 9 Channel 10 Channel 11 399.7250 399,4750 Channel 12 399.9250 Channel 13 399.9750 Channel 14

Civilian/Foreign Air Demonstration Teams

The Canadian Forces Snowbird aircraft demonstration team (431 Air Demonstration Squadron) is another regular on the U.S./Canada air show circuit. The following frequencies have been recently reported for this popular aerial team: 123.325 242.600 245.500 245.750 246.500 272.100 (Primary) 284.900 299.500 333.300 MHz.

Some frequencies for other foreign military and US civilian flight demonstration teams that have been reported to us during the past few years include:

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Civilian Flight Demonstration Teams
                          123.150
Aeroshell Aerobatics Team
All American Firebirds Flight Demonstration Team - 122.775
Bud Light Air Force (ex- Coors Microjet) - 122.925 123.350 123.475
Firecat (Rich Perkins) - 123.500
French Connection Airshow - 122.925 122.975 129.975
lan Grooms FedEx Red Bull Aerobatic Team (US) - 122.825 123.150
Lima Lima Flight Team - 123.150 123.175 123.425
Manfred Radius Glider Aerobatics Team - 123.150
North American Jet Airshows Team - 122.775 122.925 129.650
  129.925
Northern Lights Aerobatic Team) - 123.325 136.975
P-51 Mustang Flight Team - 122.850 122.875 (Commemorative Air
  Force)
Patty Wagstaff Airshows Inc - 122.750
Rayban Gold Aerobatics Team - 122.925
Red Baron Stearman Squadron - 122.725 122.775 123.150
Sean Tucker Power Aerobatics - 122.950 123.150
Skytypers Team - 122.775
Swift Magic Aerobatic Team - 122.775 122.925
Tora Tora Tora Warbirds Team - 123.450 469.500 469.550 (Com-
  memorative Air Force)
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Foreign Military Flight Demonstration Teams

Asas de Portugal, Esquadra 103 (Wings of Portugal 103 Squadron) Flight Team - 262.150

Blue Eagles Royal Army Air Corps Flight Team (UK) - 136.975 Brazilian Air Force Team (Brazil) - 130.550 130.650 132.250 Canadian Forces Skyhawks Parachute Jump Team (Canada) - 123.000

Falcons Royal Air Force Parachute Jump Team (UK) - 255.100 465.100 Frecce Tricolori Military Flight Team (Italy) - 307.800 381.000 Grasshopper Helicopter Team (Netherlands) - 281.100 Halcones Military Flight Team (Chile) - 136.175 La Patrouille Adecco Air Force Flight Team (France) - 138.450 141.825

143.100 143.850 242.650 La Patrulla Aguila Military Flight Team (Spain) - 130.500 252.500 Military Stars Flight Team (Turkey) - 264.400 279.600

Patrouille Suisse Military Flight Team (Switzerland) - 288.850 Red Arrows Royal Air Force Flight Team (UK) - 242.200 242.050 243.450 253.450

Not Just Any Old Scanner Will Do

Some of the handheld scanners currently marketed are not suited for air show monitoring. There are certain requirements your air show has to meet in order to successfully monitor the two major military aerial demonstration teams – the Blues and T-Birds.

If you are going to a Thunderbird show you will need a scanner that can monitor the 138-150 MHz military land mobile band in the AM mode. Most of the older Uniden scanners cannot be used for air show monitoring due to their lack of independent transmission mode selection.

You also need a scanner that has the 225-400 MHz military aeronautical band in it. Most of the action (especially the Blues) will be heard in this military UHF portion of the spectrum. Adding this criteria to the mix of possible radios again narrows down our choice for air show scanners even more.

I am frequently asked on the Grove Tech Line which scanner we recommend for air show monitoring. While I don't have a favorite in this regard, I have prepared the list below as a purchase guide for receivers that meet all the requirements outlined above.

Information below includes current Grove stock codes/prices (as of presstime) for the items indicated, but the price does not include shipping or taxes (if applicable). Prices are subject to change without notice, so be sure to call our Grove order department at 800-438-8155 or visit our website at http://www.grove-ent.com for current pricing.

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BOATS, PLANES, AND TRAINS

Iden Rogers

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Handoff Completed

he aircraft column has been handed off to a new column editor, so an introduction is in order. My name is Iden Rogers and I was probably born a radio nut. I am now retired and still a radio nut. By age seven, with no one's encouragement or assistance, I would dial around for hours at a time on an old floor-standing radio in the corner of my grandmother's living room – just to see what stations I could receive.

Decades ago, when the fictional Dick Tracy wrist radio was still in the comics, the idea of two-way communications without wires excited my imagination. Who knows? Maybe I have some of the shared predisposing "radio genes," since radio pioneer Reginald Fessenden (http://www.hammondmuseumofradio.org/fessenden.html) and I have a common ancestor.

By age twelve, I bought my first serious radio, a used Hallicrafters S-20R shortwave receiver, with money I had saved. At age fifteen, I earned my Novice Class amateur radio license and was a regular on 40 and 15 meters CW. I also began monitoring, first in the low band (30-50 MHz) and later, the high band (150-174 MHz) – both by way of tube-type Hallicrafters tunable receivers. Next to follow was the VHF aircraft band (118-136 MHz) with a military surplus BC-639 receiver. Aircraft listening was a fascinating new world compared to "police calls." I was hooked.

In Order Not to be Drafted

I joined the Air Force to have better educational opportunities and was trained for aircraft electronic countermeasures equipment (radar signal detection and jamming) on EB-57 aircraft, including the high altitude "D" model, a version akin to the U-2 that required pilots to wear pressure suits. I enjoyed working on the planes and being around a variety of other aircraft — with the "Century Series Fighters" being the most thrilling (http://www.wpafb.af.mil/museum/tours/vt2.htm).

After four years in the Air Force, I began to monitor military aircraft in the 225-400 MHz band with a military surplus URR-35 receiver. (This band is often called the "UHF aircraft band" or "military aircraft band," though it is also used, to a degree, for other government and military communications.) I lived 50 miles east of Los Angeles at the time, so had nice listening opportunities with the fully-operational March and Norton Air Force bases nearby. Though inland, I could hear some of the Navy and Marine aircraft activity from El Toro MCAS and south to in-

clude the San Diego area.

I had reception in varying degrees from Edwards AFB, when the aircraft were above about 16,000 feet ("flight level one six zero" FL160). One exciting series of communications catches in 1977 were the Space Shuttle *Enterprise* drop tests before there were any Shuttle launches. The *Enterprise* was never launched but only used for drop tests from a modified Boeing 747 – exciting listening and part of history nevertheless. (http://www.dfrc.nasa.gov/gallery/photo/ALT/Small/ECN-8923.jpg)

Like other listeners my age, I progressed from tunable tube receivers through the first multi-channel solid-state crystal receivers, to crystal scanners, to the Bearcat BC-101 and others, to the current crop of scanners of today – wonderful receivers that were beyond our wildest dreams.

Some Things Missing

In the middle of this progression, I found something missing – a club just for scanner listeners. There were clubs for shortwave listeners, longwave listeners, TV and FM DXers, AM broadcast DXers, but nothing for scanner listeners. I joined with a few others and became a driving force in creating and shaping the Radio Communications Monitoring Association (RCMA). It became a large, successful club for scanner listeners and with a nice monthly publication. Perhaps some of you were members. Bob Grove was even a column editor with RCMA for a time before the emergence of *Monitoring Times*.

To help give legitimacy to the RCMA as a club of dedicated and true radio hobbyists, I went through the process of gaining membership in the Association of North American Radio Clubs (ANARC), a federation of North American radio listening clubs. It took some time and convincing to enter an established world of radio listening hobbyists by us less-well-regarded newcomers, with scanners of all things, but it all came to pass and eventually RCMA became respected and the largest of the ANARC member clubs. ANARC (http://www.anarc.org/) still exists though RCMA does not, except in fond memories.

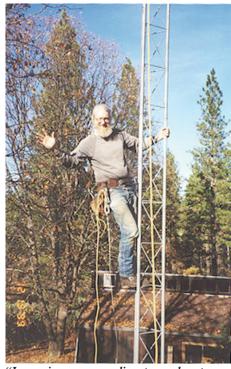
Again, there was something missing. After scanners came into being, none of them included the VHF aircraft band, not to mention the UHF aircraft band. So, being kind of an instigator, I took a survey among RCMA members and asked if they wanted to have aircraft reception capabilities in future scanners and the answer was a definite "yes." Another RCMA "founding fa-

ther," Bob Leef, contacted the prominent scanner manufacturers with our survey results and presented the case for the inclusion of the VHF aircraft band. I would like to think that our efforts influenced the evolution of scanners, since they did begin to include the aircraft band soon after. Later, the UHF aircraft band was, and still is, included many scanner models.

Getting It Together

A good part of the fun of aircraft communications listening is in learning about what is going on in the skies and on the ground as it applies generally to any area, then applying it more specifically within your own unique geographic listening environment as you listen in real time.

Each area is unique, with its own airports – some with control towers and some without, its own area-specific Air Traffic Control (ATC) and overhead flight paths, its terrain and weather peculiarities, runway numbers, radio frequencies, visual landmarks which you will hear mentioned on the radio, published approaches and departures by name, automated broadcasts, fiveletter airspace fixes, and more.



"Improving my own radio setup and my towermounted scanner antennas is an on-going process," says veteran hobbyist Iden Rogers.

Unscrambling the Puzzle

Aircraft listening is like a puzzle of sorts and one you can take to any level. The more pieces you fit together, the more enjoyment you will find in listening. At the same time, you will gain satisfaction during the process of mastering it, similar to mastering a video game. Be careful, though: you can get hooked.

Unlike public safety vehicles on the roadways, airborne aircraft – private, commercial, and military, move in three dimensions – often at hundreds of miles per hour. Thousands upon thousands of lives are at stake every day. At peak traffic periods in metro areas, it is fastpaced and complex. There is little room for error or for misunderstood communication exchanges.

Listening to an Approach Controller at any of the country's major airports at rush hour is something to behold – a magnificent orchestration. He or she is figuring out what to do with all these aircraft second by second. Our challenge is to understand what he is saying and what the aircraft are doing.

Fortunately, all the info available to pilots and much of the info available to air traffic controllers is also available to us as listeners. In fact, there is so much information that it can become a daunting, but interesting challenge to find what applies most directly to our hobby. Developing your detective and Internet searching skills can be a plus.

Understanding the Lingo

What air traffic controllers and pilots say to each other is rather precise and carefully worded; in fact, it is standardized. It must be, in order to convey the needed information quickly, precisely, and unambiguously. The *Pilot/Controller Glossary (P/CG)* can be a big help: http://www2.faa.gov/atpubs/PCG/index.htm. When you hear words and phrases from air traffic controllers that you don't understand, take a moment and look them up. Little-by-little, they will become part of your listening vocabulary.

If you are a more advanced listener or simply want "to read ahead," you might want to start becoming familiar with the *Aeronautical Information Manual (AIM) - Official Guide to Basic Flight Information and ATC Procedures:*http://www1.faa.gov/atpubs/AIM/index.htm.

And next up, you may want to look through *Order 7110.65N Air Traffic Control* or at least be aware of its existence: http://www2.faa.gov/atpubs/ATC/index.htm. It is the air traffic controller's official handbook.

Assigned Frequencies

Needless to say, it is essential to find and program into your scanner the frequencies that will give you the full picture of aircraft activity in your area. A good place to start is AirNav: http://www.airnav.com/airports/. You can begin by selecting known airports in your listening radius or you can click on "Browse by U.S. State" to discover all the airports in your area, some of which may be unknown to you. Each airport listing will give the frequencies at the airport and those for Approach / Departure Controls.

For those who would like a printed guide, there is a good one that gives information similar to AirNav – the *Airport / Facility Directory*

(A/FD). It contains "data on public use and joint use airports, seaplane bases heliports, VFR airport sketches, NAVAIDs, communications data, weather data sources, airspace, special notices, and operational procedures."

The A/FD does not include UHF frequencies but it does include Air Route Traffic Control Center (ARTCC) frequencies which are necessary for complete frequency coverage. There are seven volumes, each for a part of the U.S. at \$4.20 each. To see which volume you want, go to http://avn.faa.gov/content/naco/images/AFD_Index.gif. One among many retailers who carry the A/FD is: http://store.pilotshop world.com/airfacdirafd1.html. A small airport near you may also carry them, or you can order them from the government; see below.

And, for the more advanced listener, or one who wants VHF and UHF frequencies for U.S. military airbases and ARTCC frequencies, the *IFR Supplement U.S.* is a must, and it's a deal at \$7.25. Civilian airports that have no military utility value are not included, but that doesn't matter if you also use AirNay or the



A/FD.

For ordering info, go to http://avn.faa.gov/index.asp?xml=naco/prices and click on "NGA Aeronautical Price List.....PDF" for the *IFR Supplement U.S.* and see page 2, one third of the way down the first column. For the *A/FD*, instead click on "NACO Aeronautical Price List....PDF." In both cases, you will note other items you may want to learn about and consider at some point.

Frequency Allocations

A frequency allocation is a designation for the specific use of a given frequency. Users are then assigned to appropriate frequencies among the many allocations. It can be helpful to have references to frequencies by allocation, such as when programming a search range into your scanner. Take a look at the allocations list *National Civilian Aeronautical Band Assignments* By Larry Van Horn, Assistant Editor, *Monitoring Times* at: http://www.monitoringtimes.com/html/mtcivair.html.

To see how all the frequency bands (blocks of similarly allocated frequencies) fit together,

with the aircraft bands among them, see the *US Frequency Allocation Chart* at: http://www.ntia.doc.gov/osmhome/allochrt.html . It can be saved to disk as a PDF file and referred to at any time via your computer or ordered as a large wall chart – informative and great looking on the radio shack wall.

For advanced listeners, info nuts, and compulsive devourers of fine print, the *Code of Federal Regulations (CFR) Title 47, Part 87 Aviation Services* can be informative and includes all the frequency allocations. *Part 87* and many aircraft-related topics can be found with the outstanding search engine: http://www.google.com/

Give the above monitoring ideas a try and explore the Internet sites. Don't forget to write down what you hear and where you hear it for later reference. Good note-taking in this hobby is very important.

The Aircraft Column

Though never a pilot nor an air traffic controller, I look forward to sharing my knowledge and listening experience with you. I have had opportunities to visit the Los Angeles Air Route Traffic Control Center (ARTCC) and the Ontario Terminal Radar Approach Control facility (TRACON), now part of SoCal TRACON (http://www.socaltracon.com/ WhatIsSCT.php), plus several control towers. Also, I, as many of you, have spent hours watching aircraft at large and at small airports and military bases - sadly, not such a good idea during these post 9-11 days. Improving my own radio setup and my tower-mounted scanner antennas is an ongoing process which also contributes information and knowledge to pass on.



I intend for this column to be informative and enjoyable over a broad range of civilian aircraft communications-related topics. We'll keep it simple enough for beginners but include things for more advanced listeners. Suggestions for future column topics are welcome, as are Internet links to sites that you find valuable to the hobby. I look forward to hearing what you enjoy most about listening in the 118-137 MHz band and on the HF (shortwave) transoceanic frequencies. Email is welcome or snail mail sent in care of *Monitoring Times*.

Mailbag

e've got a big stack of mail this month. (Okay, it's email, so it doesn't stack very high, but there's still plenty of it!)

Power versus Height

We'll start in Lexington, Kentucky, with Timothy Kuryla. Timothy writes, "...when I once perused the *Broadcasting Yearbooks* in the 1970s, I noticed the New York City FM stations had rather puny powers. Nothing in the 50 or 100 kW range." He's right; with two exceptions, the most powerful FM station in NYC is WCBS-FM with 6,800 watts.

The FCC has established a power limit of 50,000 watts for AM stations. The same limit applies to FM in what they call "Zone I" (*very* roughly, the area northeast of the southwestern corner of Illinois). However, on FM power isn't the only determining factor for coverage. Antenna height is also critical. So, along with the 50,000-watt power limit, FM also carries a tower height limit. In Zone I, this limit is 150 meters or 492 feet.

In some cities – notably New York and Chicago – there are many buildings far taller than 150 meters. Any station with a lower antenna would suffer severe multipath interference, as their signals bounce off the buildings. The only really sensible place for FM transmitting antennas in these cities is atop the tallest skyscrapers.

The FCC allows stations to "violate" the 150-meter limit, provided power is reduced to compensate. For example, eight NYC stations are allowed to share a 415-meter-high antenna on the Empire State Building; in return, they're required to reduce power from 50,000 watts to 6,000. In Chicago, a number of stations share an antenna at 425 meters atop the Sears Tower, and must reduce power to roughly 5,700 watts.

(Television stations are similarly limited, though the limit is 300 meters in the Northeast; 600 meters for UHF. In the area outside Zone I, FM stations are limited to 100,000 watts at 600 meters, roughly 2,000 feet. For example, Albuquerque FM stations, atop Sandia Crest at roughly 1,260 meters, are limited to roughly 22,000 watts.)

Promises as Empty as Air

Timothy also saw the ad for the "XiumAir Dish Type Antenna" on http://www.goxium.com. This \$129.95 antenna looks like a small microwave dish – the size is difficult to tell from the photo in the ad but

it looks like a foot or two in diameter. It looks like one of the 2 GHz microwave antennas used for "wireless cable" in the early 1990s. They claim it "works in conjunction with satellite systems" and contains "Patented Spilateral Techhnology." (The spelling error isn't mine!)

He asks, "how can such an antenna work?" My best guess is that it doesn't! In general, a dish antenna must be several wavelengths in diameter to behave like a dish. At 200 MHz (TV channel 11), a wavelength is 1.5 meters or about 5 feet. This Xium antenna is way too small to behave like a dish at channel 11. For FM radio and lower TV channels, it's even worse. If you live near a TV station, you can probably receive it on this antenna. A few feet of telephone wire will probably work just as well, and costs a lot less than \$130! There are a lot of, shall we say, *strange* TV antenna designs out there.

Unusual Reception

James Maharg on the outskirts of Chicago reports some international DX. Using a Sony ICF-2010 and loop antenna, for several days in mid-December James was able to hear Radio Cadena Nacional from Colombia on 760 kHz, underneath Detroit's WJR. The station could be heard throughout the night, but seemed best around 1000UTC. James' best guess is he was hearing the Barranquilla outlet.

Ron Van Sant WA0JEN in the Quad Cities heard an unusual signal early December 28th. On 1640 kHz around 0623 UTC, he heard a repeated recording "CBS Radio Network Channel 42," followed by several seconds of tone. It was about S7 in eastern Iowa.

It would appear someone (probably a computer!) was asleep at the switch - failing to switch sources when the CBS News ended and carrying the "marker" CBS feeds between newscasts. My best guess is this was KMMZ Enid, Oklahoma, first reported by our own Glenn Hauser and QSLed by Patrick Griffith. The other stations on 1640 are a business-talk outlet near San Francisco; a religious station in Portland, Oregon; a Spanish-language station in Salt Lake City; and Radio Disney in Milwaukee. I don't believe any of these other stations would be likely to be carrying any CBS programs. (Though you can't rule out the possibility someone selected the wrong channel on their satellite receiver!)

Patrick Griffith has received two new QSLs. WGN-720 verified for a test on the morning of December 1st; the card came via



Patrick Griffith's QSL from WNAX-570

James Carollo, DE, 435 N. Michigan Ave., Chicago 60611. The QSL pictured here came from WNAX-570 Yankton, South Dakota. (David Onsted, GM, 1609 E. Highway 50, Yankton SD 57078) WNAX believes the 960-foot tower they use for non-directional day-time operation is the tallest in use by an AM station in the USA, and they believe their 250,000-square-mile daytime coverage area is the largest of any U.S. station. They're probably right!

Bits and Pieces

Frequency shifts and changes: There's another new expanded-band station on the air. WFNA-1660 is in Charlotte, North Carolina, and runs a sports format. WFNA took over one of the towers of co-owned WGIV-1600's antenna; as a result, WGIV is now silent.

Another station isn't new to the air but has made a major frequency change; WKTW-1530 near Pittsburgh has moved to 770 kHz. They've actually *reduced* power slightly, but the lower dial position will greatly improve coverage. WKTW is a daytime-only station – try for them near sunrise and sunset.

Reports suggest CFAV-1570 Laval (Montreal), Quebec, is testing. 1570 has been a rather clear frequency in the East since the three dominant stations in Canada (CFOR, CHLO, and CKLM) went off the air. CFAV will be a French-language nostalgia station – and will probably be widely heard once routine nighttime broadcasts begin.

Beverage URL: Beverage antennas are generally acknowledged as the most effective type for AM broadcast DXing. Glenn Swanson KB1GW has posted a new web page devoted to these antennas. Check out http://members.cox.net/kb1gw/bev-page.htm.

Write me at 7540 Highway 64 West, Brasstown NC 28902-0098, or by email to dougsmith@monitoringtimes.com. Good DX!

Unusual Unlicensed BC QSLs

erhaps we can tell that April Fool's Day will be coming up pretty soon, since bizarre and unusual QSLs have been frequent topics of discussion among DXers this winter. A topic like that is certainly fodder for the Monitoring Times Outer Limits column.

Harald Kuhl checks in with an unusual clandestine QSL that he received from the German Department of RAE Buenos Aires for an RAE sideband feeder transmission from Cable and Wireless Port Stanley during the Falklands/Malvinas War. He got this one despite the fact that he did not hear the actual Falkland Islands Broadcasting service on shortwave, but instead heard only the utility feeder broadcast. Congratulations on this one go to Harald.

The most unusual pirate QSL of all time clearly goes to **Spam Radio**, a legendary pornographic photo in extremely poor taste. The graphic nature of this QSL sheet was so extreme that we can't really discuss it in the pages of a family magazine distributed through the US mail.

Your editor's own most unusual QSL was the sheet that I received from the FCC itself, for their bust announcement on the occasion of the shutdown of pirate station WHBH. A copy of this highly unusual QSL is posted at http://www.nacs.net/~georgez/WHBH.JPG on the internet.

Do any of our readers have nominations for any other unusual QSLs for unlicensed broadcasting stations?

♦ Iraq Clandestine Shuffle

One of the little noted impacts of the war in Iraq has been a major shuffle among the various clandestine stations that have been broadcasting toward that country. Martin Schoech's outstanding Clandestine Radio Watch newsletter, citing information from the BBC Monitoring Service, notes that one of these changes has been the neardemise of the anti-Iran Voice of the Mojahed clandestine. Many have presumed that these transmissions were facilitated by Saddam Hussein's government, thus accounting for some of their erratic behavior lately. BBCMS further reports that the "Vision of Resistance TV" (Sima-ye Mogavemat) television station has now appeared on the same satellite frequency that was formerly used by the Mojahed clandestine.

Given the continuing conflict in Iraq, additional shakeups in the middle eastern clandestine broadcasting scene are virtually certain. If you would like to check out the web site of **Voice of the Mojahed, http://www.iran.mojahedin.org/** is the place to go on the internet. The People's Mojahedin of Iran web site is in Arabic, just like

the programming on many Middle Eastern clandestine stations.

Pirate Radio at Fest

The time of year has arrived when we have to discuss the Winter Shortwave Listening Festival. It remains the largest annual gathering of radio monitoring hobbyists in the world. This year's gala 14th annual Fest is scheduled for March 12 and 13, 2004 in Kulpsville, PA, at the Best Western "The Inn at Towamencin" near Philadelphia. Detailed information is available at the new Fest web site found at http://swlfest.com/ or via snail mail for an SASE at SWL Winterfest, PO Box 4153, Clifton Park, NY 12065.

This event covers all aspects of radio monitoring, not just pirate radio. But, there always is intensive interest in unlicensed broadcasting at the Fest, including an annual Forum discussion. Hundreds of DXers from all over the world are making plans to attend the Fest once again this year. Several *MT* staff will be among them, and we hope to meet you there!

New Europirate Address

Courtesy of Martin Schoech, we now know that the SRS Germany Europirate maildrop sports a new address. The address is: SRS Deutschland, - station name -, Postfach 101145, 99801 Eisenach, Deutschland. A number of European pirate stations, including **Crazy Wave Radio**, utilize this address. Return postage, normally \$2 US cash, is required for reports to this address.

Florida/Pennsylvania Pirates

Historically, the state of Florida has been a hotbed of FM pirate and shortwave clandestine broadcasting. If you would like to keep up on the latest trends in this phenomenon, Terry Kreuger's outstanding web site at http://home.earthlink.net/~tocobagadx/flortis.html on the internet is well worth checking out.

Meanwhile, the well known W9YI amateur radio information resource reports that a Hispanic FM pirate has been very widely reported in Philadelphia and New Jersey, apparently running fairly high power on 95.3 MHz.

What We Are Hearing

Our readers heard all of these North American pirate broadcasters this month, with apparently somewhat reduced volumes of shortwave pirate broadcasting lately. All pirates operate on a sporadic schedule, but shortwave pirate broadcasting increases noticeably on weekends, and during major holiday periods. You have to tune

your dial up and down through the pirate radio band to find the stations, but the new main North American pirate frequency of 6925 kHz, plus or minus 30 or 40 kHz is the place to scan for the pirates. The old 6955 and 6950 kHz frequencies are increasingly abandoned by pirates because of interference from licensed stations, but there are occasional broadcasts there.

Border Radio- The sly comedy on Static Phil's new pirate includes a "Mean Farmer Show" segment. (None announced)

Grasscutter Radio- Rock music and pirate radio issues always dominate their shows. (Uses grasscutterradio@yahoo.com e-mail)

KIPM- Alan Maxwell's existentialism dramas remain the most complex literary fare on shortwave radio today, either licensed stations or pirates. Their elaborate web site at http://homepage.mac.com/kipm/Menu5.html is well worth a look. (Elkhorn)

Oxycontin Radio- The drug comedy and music on this station predated Rush Limbaugh. (None announced lately)

Purple Nucleus of Creation- Complex psychedelic rock compositions are the main fare here. (Elkhorn)

Radio Free Speech- Bill O. Rights has returned. His shows mix rock and comedy segments, but his primary ideology is the promotion of individual freedom. (Blue Ridge Summit)

Radio Pigmeat International- Their entertaining station name is a cover for programming that features mostly classic rock music. (Belfast)

Radio Piraña International- This well known South American pirate survived two disasters in late 1993. Their operator survived a serious automobile accident, and their transmitter went on the fritz. They say that they will still be active around 6300 kHz variable, at times. (Santiago)

Radio Xanax- Somebody dusted off an old tape of this classic pirate over the holidays. We see the old QSL here for "The Relaxation Station." (Try Blue Ridge Summit)



Ragnar Radio- Although this one is normally a rock music station, your editor is hearing them as he types this column in a QSO two-way conversation with Border Radio and Grasscutter Radio. They have been QSLing. (Uses rangarradio@yahoo.com e-mail)

Sunshine Radio- There is some question about whether the announcer on this one is a female or a younger male. The format remains rock music with ID announcements in a heavy south-

All Frequencies MHz

robertsmathers@monitoringtimes.com

Telesat Canada Anik E1

C-Band	– 109.2 degrees West longitude
1A(H)	3720
1B(V)	3740
2A(H)	3760
2B(V)	780
3A(H)	3800
3B(V)	3820
4A(H)	3840
4B(V)	3860
5A(H)	3880
5B(V)	3900
6A(H)	3920
6B(V)	3940
7A(H)	3960
7B(V)	3980
8A(H)	4000
8B(V)	4020
9A(H)	4040
9B(V)	4060
10A(H)	4080
10B(V)	4100
11A(H)	4120
11B(V)	4140
12A(H)	4160
12B(V)	4180
No video	observed after Anik E1 moved here from the
118.7 de	grees West longitude orbital location.

Telesat Canada Anik E1

Ku-Band	d – 109.2 degrees West longitude
T01(V)	11717
T02(V)	11743
T03(V)	11778
T04(V)	11804
T05(V)	11839
T06(V)	11865
T07(V)	11900
T08(V)	11926
T09(V)	11961
T10(V)	11987
T11(V)	12022
T12(V)	12048
T13(V)	12083
T14(V)	12109
T15(V)	12144
T16(V)	12170
T17(H)	11730
T18(H)	11756
T19(H)	11791
T20(H)	11817
T21(H)	11852
T22(H)	11878
T23(H)	11913
T24(H)	11939
T25(H)	11974
T26(H)	12000
T27(H)	12035
T28(H)	12061
T29(H)	12096
T30(H)	12122
T31(H)	12157
T32(H)	12183
No video	observed after Anik E1 moved here from

118.7 degrees West longitude orbital location.

TeleSat Canada Anik E2R

C-Band - 111.1 degrees West longitude						
1A(H)	3720	(none)				
1B(V)	3740	Occasional video				
2A(H)	3760	Data Transmissions				
2B(V)	3780	Data Transmissions				
3A(H)	3800	Data Transmissions				
3B(V)	3820	Occasional video				
4A(H)	3840	Data Transmissions				
4B(V)	3860	Telesat Canada services (digital) Meteo Media				

5A(H) 5B(V) 6A(H) 6B(V) 7A(H) 8B(V) 8A(H) 9B(V) 10A(H) 10B(V) 11A(H)	3880 3900 3920 3940 3960 3980 4000 4020 4040 4060 4080 41100 4120	TV5 USA TV5 France Blue Bonnet RD1 Radio Quebec Telemedia radio – CITE Montreal Telemedia radio – CKAC Montreal Occasional video Otata Transmissions Occasional video Data Transmissions Occasional video Data Transmissions Otata Transmissions Data Transmissions Data Transmissions Data Transmissions Data Transmissions Otata Transmissions
11B(V) 12A(H) 12B(V)	4140 4160 4180	Data Transmissions Data Transmissions Occasional video

Telesat Canada Anik E2R

Ku-Bane	d - 111.1	degrees West longitude
T01(H)	11720	Data Transmissions
T02(V)	11750	Data Transmissions
T03(H)	11750	Data Transmissions
T04(H)	11780	Data Transmissions
T05(V)	11810	Data Transmissions
T06(H)	11810	Data Transmissions
T07(H)	11840	Data Transmissions
T08(V)	11870	Data Transmissions
T09(H)	11870	Star Choice DBS (digital)
T10(H)	11900	Occasional video
T11(V)	11930	Data Transmissions
T12(H)	11930	Occasional video
T13(H)	11960	Star Choice DBS (digital)
T14(V)	11990	Star Choice DBS (digital)
T15(H)	11990	Star Choice DBS (digital)
T16(H)	12020	Star Choice DBS (digital)
T17(V)	12050	Star Choice DBS (digital)
T18(H)	12050	Star Choice DBS (digital)
T19(H)	12080	Star Choice DBS (digital)
T20(V)	12110	Occasional video
T21(H)	12110	Star Choice DBS (digital)
T22(H)	12140	Star Choice DBS (digital)
T23(V)	12170	Saskatchewan CommunicaNetwork
		(SCN) (digital)
T24(H)	12170	Star Choice DBS (digital)

Satelites Mexicanos Solidaridad 2

C-Band - 113 degrees West longitude					
1N(V)	3720	PCTV – Television Por Cable (digital)			
1W/L(H)	3740	Data Transmissions			
2N(V)	3760	Data Transmissions / XEWH-TV			
' '		Hermosillo (digital) / Radio Sonora			
		(digital) / TvSat (digital)			
1W/U(H) 3780		Data Transmissions / TeleMichoacan			
' '		(digital) / Radio Michoacan (digital)			
3N(V)	3800	Edusat (digital)			
2W/L(H)	3820	Data Transmissions			
4N(V)	3840	Data Transmissions / XHGV-TV			
		Veracruz (digital) / Television			
		Tabasquena (digital)			
2W/U(H)	3860	Data Transmissions / XHIMT-TV TV			
		Azteca (digital) / Television			
		Mexiquense (digital) / Radio			
		Mexiquense (digital)			
5N(V)		3880 (none)			

	3W/L(H)	3900	Data Transmissions / Central TV (digital)
I	6N(V)	3920	Television Mundo Maya (digital)
I	3W/Ú(H)		Data Transmissions
I	7N(H)	3960	(none)
I	4W/L(H)	3980	Data Transmissions
I	8N(V)	4000	Data Transmissions
I	4W/Ú(H)	4020	Data Transmissions
I	9N(V)	4040	MVS Television Empresarial (digital)
I	5W/L(H)	4060	Data Transmissions
I	10N(V)	4080	Data Transmissions
I	5W/U(H)	4100	Data Transmissions / XHRCG-TV
I			Saltillo (digital)
I	11N(V)	4120	(none)
I	6W/L(U)	4140	(none)
I	12N(V)	4160	Data Transmissions
I	6W/U(H)	4180	Data Transmissions / Hidalgo Televi-
I			sion (digital) / Radio Hidalgo (digital)
ı			/ TV Nuevo Leon (digital)
1			

Satelites Mexicanos Solidaridad 2

Ku-band - 113 degrees West longitude					
T01(H)	11730	(none)			
T02(H)	11791	Data Transmissions			
T03(H)	11852	(none)			
T04(H)	11913	(none)			
T05(H)	11974	Data Transmissions			
T06(H)	12035	(none)			
T07(H)	12096	Data Transmissions			
T08(H)	12157	Data Transmissions			
T09(V)	11743	Data Transmissions			
T10(V)	11804	Data Transmissions			
T11(V)	11865	Data Transmissions			
T12(V)	11926	Data Transmissions			
T13(V)	11987	Data Transmissions			
T14(V)	12048	Data Transmissions			
T15(V)	12109	(none)			
T16(V)	12170	Data Transmissions			

Satelites Mexicanos Morelos 2

C-Band – 114.8 degrees West longitude 1W/L(H) 3720 1N(V) 3740 1W/U(H) 3760 2N(V) 3780 2W/L(H) 3800 3N(V) 3820 2W/U(H) 3840 4N(V) 3860 3W/L(H) 3880 5N(V) 3900 3W/Ú(H) 3920 6N(V) 3940 4W/L(H) 3960 7N(V) 3980 4W/U(H) 4000 8N/V 4020 5W/L(H) 4040 9N(V) 4060 5W/U(H) 4080 10N(V) 4100 6W/L(H) 4120 11N(V) 4140 11N(V) 4140 6W/U(H) 4160

This satellite operates in an inclined orbit. No activity has been observed.

Satelites Mexicanos Morelos 2

Ku-Band	1 – 114.8	degrees	West	longitude
TO1K(H)	11764			

T02K(H) 11888 T03K(H) 12012 T04K(H) 12136

12N(V)

4180

This satellite operates in an inclined orbit. No activity has been observed.



Congratulations, LWCA!

ongratulations to the Longwave Club of America (LWCA) on 30 years of service! In January 1974, a small but enthusiastic group of experimenters (mostly from the West Coast) started the club to promote listening on the frequencies below 550 kHz. From this small start, the club has grown to over 500 members and continues to publish the *Lowdown*, its monthly journal. The journal is the "glue" that holds the club together and is today the foremost publication for longwave news, loggings and technical topics for North American operators.

The first issue of the *Lowdown* was printed



Jol, 1 #1 Page 1

January, 1974

Dublished by the Long Wave Club of America to promote listening below 550 kBz. Bulletins are monthly and deadlines are the third Saturday of each month,

EDITOR: Jeff Bessier, 10361 Shirley St., Northridge, CA 91324. PUBLISHER: Don Erickson, 6059 Essex St., Riverside, CA 92504. PRESIDENT: John Clesente, 11425 Albers St. 85, North Bollywood, CA 91601.

Masthead from the first Lowdown journal, January 1974. For current information on the LWCA, including membership details, please visit http://www.lwca.org.

in a standard 8.5" x 11" format and was just two sheets long. The page count grew steadily over the years and in the early 1980s it took on the now familiar 8.5" x 5.5" booklet format. I was very fortunate to receive a large number of back issues of the *Lowdown* from *MT* reader Martin Linke (IL), who was an early subscriber. Looking through these back issues gives an interesting view into how the club began and the enthusiasm of its pioneering members.

The February 1974 issue (#2) mentions a project that was underway to document aircraft beacons on the longwave band. Amazingly, computers were already being used for this work. Those familiar with computer history know that it wasn't until the late 1970s that desktop computers became generally available to individual users, and it wasn't until the early 1980s that they were commonly used for publishing applications. This early use of computers may be explained by the group's proximity to the "Silicon Valley."

Not everything was computerized in those early days, however. The September-October 1981 issue, for example, admonishes contributing editors to "keep the typewriter keys clean and use a good dark black ribbon"!

At this milestone of 30 years, we certainly owe a debt of gratitude to the founders of the LWCA and to those who have carried on the work over the years. While relatively few of the founders and early members are with us today, their efforts are reflected in the large pool of information that we have available and in the advancements made in weak-signal reception and license-free "Lowfer" operation. I would like to offer my personal thanks to those pioneering members who made the LWCA what it is today.

Below is a list of the Charter Members of the club, as recorded in Volume 1, #1 of the *Lowdown*, January 1974. It is perhaps fitting that the one Charter Member who was *not* from the West Coast was from North Carolina – the birth-place and current home of *Monitoring Times* Magazine. Oh, and I almost missed it... a few years later, the September-October '81 issue reports a brand new member to the LWCA – Robert B. Grove, of Brasstown, NC!

LWCA Charter Members

Louis A and Elinor F. Leistner (CA)
Clinton E Tatro (CA)
Walter K. Raes (CA)
Dick Nelson (CA)
Spence Naylor (CA)
Stewart MacKenzie (CA)
George McKay, Jr. (CA)
Helmut K. Silge (CA)
John Lauerman (WA)
Greg Hardison (CA)
Don Erickson (CA)
Greg Allison (NC)
Jeff Brasier (CA)
John Clements (CA)

Over to You

Speaking of history, I'd like to hear from *you* on how you got started in the longwave hobby. Many articles have appeared over the years on how people got started in radio, and I never tire of reading them. It occurred to me, however, that many folks undergo a "second epiphany" when they discover a part of the spectrum that is especially dear to them. Why not share the story of how you became interested in longwave and some of your favorite first moments in the hobby?

Your story needn't be long or fancy; just jot down the highlights of your first steps into longwave, and I'll take it from there. I'll share these stories as space allows, in future editions of *Below 500 kHz*. Who knows, it may be your experience that inspires someone else to check out the LF band for the first time.

Out-of-Range

Although not technically longwave-related, an interesting news item on beacons appeared in the *Democrat & Chronicle Newspaper* (Rochester, NY). The November 30th, 2003, edition car-

ried a story about the first rescue in the contiguous United States using a Personal Locator Beacon (PLB). A lone hiker in the Adirondack Mountains activated his 406 MHz beacon to summon aid through the Satellite Alerting system, and a U.S. Army helicopter appeared a short time later.

PLBs are now approved by the FCC for use in the Lower 48, following extensive tests in Alaska. They range in cost from \$400 to \$1,000, according to the article. More info on PLBs can be found at http://www.equipped.com/.

Winter SWL Festival

Ham radio has Dayton; we have Kulpsville! The 17th annual *Winter SWL Festival* will be held March 12 - 13 in Kulpsville, PA (near Philadelphia) at the Best Western Inn at Towamencin. This event has become the premier gathering for radio listeners in North America, and often features excellent programs on Longwave and Mediumwave DXing.

Attending the Fest is a great way to learn more about your hobby, meet fellow DXers, and see the latest gear that's available. The camaraderie at Kulpsville is hard to describe, but I can tell you that after 25+ years of listening, my enthusiasm for the hobby was recharged after a visit to Kulpsville in the late 1990s. For complete information on the SWL Fest, please visit http://www.swlfest.com/.

I will be presenting a program on Longwave Radio at this year's show. I look forward to meeting as many *Below 500 kHz* readers as possible. Drop me a line if you plan to go, and feel free to bring along your best loggings/QSLs for this forum. For complete information on the SWL Fest, please visit http://www.swlfest.com/.

73 and best LW DX.

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♦	SWL	IR Remote	for FRG-	8800.		\$59.95
♦	SWL	IR Remote	for ICON	l Trans	ceivers	\$59.95
♦	SWL	IR Remote	for Drake	e R8/A/	В	\$89.95
٠	SWI	IR Remote	for Unida	an Sca	nnore	¢00.05

www.swl-remotes.com

tjarey@monitoringtimes.com

The Rarest of DX

ve always been an "Accidental DXer." I've earned my DXCC but it took me something like 24 years to achieve it. I've been a bit more diligent in trying for QRP DXCC with about 75 verified countries in four years. In that rather meager effort, I only have an Honor Roll total of around 117 countries – well less than half of the potential DX targets over the horizon. I just have too much fun ragchewing to get all sweaty-palmed about DX pileups and such.

But for a good chunk of the amateur radio population, chasing DX is the be-all and end-all of the ham hobby experience. Even in the world of dedicated DX chasers with the best equipment they can afford and years of operating skill and savvy, there remain a handful of DXCC entities that seem to stay almost perpetually out of reach of even the most rabid DXer. There are always a few countries/entities that either have no active hams or who make it impossible for outsiders to come in and set up a station.

I can still remember the rush of excitement some years ago when China, long without ham activity, came back into the radio hobby world with the activation of BY1. Almost overnight they went from being the rarest of DX to an almost common DX contact. (Okay, I still don't have a China QSL card, but that is my laziness not the Chinese ham community's lack of effort.)

The list of the rarest of the rare, the top 10 tough contacts, as polled by various DX clubs and organizations, has remained fairly stable for a number of years. However, recent events in the world have caused a bit of

Andaman Island is a prime Tourist destination but do not plan to bring any ham gear with you on your trip.

a shift in matters. Three of the all-time toughies have now moved down the list. Also, at any given time, there are hams worldwide who are chasing the challenge of further upsetting the list with activity from these rarest of the rare DX sites. Let's take a look at the lay of the land in the current top ten. But first, let's see how those three stations moved down the wish list recently.

VP6D Ducie Island

Ducie Island was the hottest commodity to come along in ham radio in a long time. Ducie Island is a small uninhabited island in the Pitcairn group - Pitcairn Island being made famous by the story of the Mutiny on the Bounty but known also to hams for the operating activities of Bounty crew descendant Tom Christian VP6TC. Anyway, in late 2001 a determination was made that Ducie Island qualified as that rarest of all things, a brand new DXCC entity.

Think of it - all those Honor Roll folks who "worked 'em all" had to dust off their equipment for one more go. Once the word was given that Ducie was legal, it was quickly activated by the VP6DI DXpedition to the tune of over 40,000 QSOs! Consequently, Ducie Island slipped out of the number one most wanted slot rather rapidly and it is likely to stay in the realm of the merely difficult but not impossible DX destinations.

P5 North Korea

A glance at the headlines will give you dozens of reasons why North Korea might not be the most ham friendly country in the

> world. As a matter of fact, until Ducie Island came along, it held the number one hard-to-get QSO spot for many years. The Democratic Peoples Republic of North Korea's government is just not in the habit of letting anyone from their country play radio, let alone anyone visiting their country. Operation from North Korea was closer to non-existent than it was to rare.

> But then a funny thing happened in November 2001. Ed, 4L4FN, a Georgian citizen employed by the United Nations World Food Program, became active as P5/4L4FN in Pyongyang. He continued to operate for al

most a year, logging over 16,000 QSOs and making a lot of hams very happy. Just as suddenly as he came on the air, in November 2002 representatives of the DPRK government came to his shack and told him to cease operating and dismantled his station.

Ed's operation as P5/4L4FN moved North Korea out of the top ten tough entities for now, but unless there are significant changes in the political mood towards the outside world in North Korea, it's a fairly safe bet that P5 will work its way back up the list to number one once again.

VP8SA South Sandwich Islands

The South Sandwich Islands are about 1000 clicks east of the Falkland Islands. They are administered by the United Kingdom. The Islands are uninhabited except for scientists from the British Antarctic Survey. With no population to speak of and being essentially on the edges of the Antarctic, it's little wonder that this DX entity was "number six with a bullet" on the hard-to-get list for a long time. But recent activity, largely thanks to Carl G4VFU, has given a lot of hams the opportunity to put this one in the book.

◆Today's Top Ten

These three entities that dropped from the top ten most-wanted places reflect the basic reasons why entities move around on the lists over time: politics, population (or more accurately, lack thereof) and rule changes. Now let's take a look at what many folks consider to be the current top ten toughto-get DXCC entities and see where there is (or isn't) cause to get our hopes up to fill out the full Honor Roll list.

VU4 ANDAMAN & NICOBAR ISLANDS VU7 LACCADIVE (LAKSHDEEP) ISLANDS

Many DX groups see VU4 as the current number one hard to get OSO and list VU7 as the third hardest. I am not entirely clear as to why they are separated on the list, because both these DXCC entities are under the same restrictions. Both are islands belonging the nation of India, a country with an active amateur radio population.

However, the Indian government ruled that only amateurs who were citizens living on those islands could operate under the VU4 and VU7 callsigns (effectively barring DXpedition activity). Since there were no hams and no one seeking licensure, there was no activity. More recently, in 1992, the Indian government went on to rule that they would no longer issue *any* callsigns in the VU4/VU7 grouping, in essence, banning ham radio from the Andaman, Nicobar and Laccadive (Lakshdeep) Islands.

Another complication seems to be that the Indian government is very frustrated by attempts to get permission to operate from these islands. This is kind of ironic, because they widely advertise the islands as excellent tourist destinations. What better way to get folks to come over and spend their hard currency than to let some hams show up from time to time and rack up a few thousand QSOs? There have been a number of stations claiming to have operated as VU4 or VU7, but the current position of the DXCC ruling body is that these stations were pirates and their QSLs cannot be presented for DXCC credit.

BS7 SCARBOROUGH REEF

(You know I am just dying to make a silly joke involving Simon and Garfunkle at this point, right?) Anyway, Scarborough Reef is the number two hardest to get DXCC entity in the minds of many DX chasers these days. Also known as Huang Yan Dao, Scarborough Reef is an isolated lump of coral in the South China Sea. It was last activated in 1997 as BS7H. And while the Peoples Republic of China has come a long way over the years in the amateur radio world, they do remain somewhat suspicious of foreign nationals running around their reefs carrying a bunch of radio equipment. Still, this is one of those places where diplomacy and world image can go a long way, so keep your eyes on this entity in the future.

3YP PETER 1 ISLAND

Number four in our top ten, Peter I Island was discovered in 1821 and the island was named after the Russian Czar, Peter the Great. Peter I was later claimed by Norway in 1929. The island is essentially an extinct volcano usually surrounded by pack ice. Direct access to the island is difficult at best and the expense of a DXpedition to such a location would be out of reach of even the deepest ham radio pockets. One DX source described it as being explored less frequently than the moon! Still, it has been activated by hams at least twice, most recently in 1996 as 3YOPI by a Russian science expedition.

FRJ JUAN DE NOVA, EUROPA

Juan de Nova Island is a French possession since 1897. It is a small island in the Mozambique Channel near the Southern part of Africa, about one-third of the way between Madagascar and Mozambique.

Not totally unoccupied, there is a small French military garrison along with a few meteorologists. It is also occasionally visited by other scientists. I could find no information on any recent activations, but given that the "mother country" has many active hams,

maybe one day an amateur radio oriented soldier or scientist might get assigned there and change the top ten list once more.

KP5 DESECHEO ISLAND

Desecheo Island is a U.S. Territory measuring a mere 360 acres (0.56 square miles). It is located in the Mona Passage between Puerto Rico and Hispaniola. Desecheo Island's terrain is rugged and it is home to the Desecheo National Wildlife Refuge. It is an important site for rare seabird nesting. Rarer still are ham radio operations. Desecheo Island was last activated in 1992.

KP1 NAVASSA ISLAND

Navassa Island is a U.S. Territory located between Jamaica and Haiti. Its total land mass is only about 2 square miles. It is uninhabited and is administered by the U.S. Fish and Wildlife Service, U.S. Department of the Interior. Permission is required to travel to Navassa Island. It was activated most recently by K8RF in 1998 under the callsign N1V.

YVO AVES ISLAND

Aves Island belongs to Venezuela and it is situated right in the middle of the Caribbean Sea. Aves Island is only 150 yards long and 30 yards wide!

The island is slowly disappearing and it is possible that Venezuela will eventually lose its sovereignty to the Caribbean Sea. Further, Hams will be down one entity once again. There is some good news, however. By the time you read this, Aves Island should be well down the DX list because the Club Station YV5AJ will have completed its DXpedition to celebrate their 70th anniversary.

70 YEMEN

Yemen is still recovering from over two decades of civil war, during which ham radio operation was not a big concern for either the North or South Yemen governments. In spite of oil assets it remains one of the poorest Arab countries, with all the inherent infrastructure problems that would make hamming hard. But, since unification in 1990, there have been some attempts to get this one into people's log books, most notably OH2YY's operation in 2002.

UNCLE SKIP'S CONTEST CORNER

ARRL International DX Contest (Phone) Mar 6 0000 UTC - Mar 7 2400 UTC

RSGB Commonwealth Contest (CW) Mar 13 1000 UTC - Mar 14 1000 UTC

Wisconsin QSO Party Mar 14 1800 UTC - Mar 15 0100 UTC

Virginia QSO Party Mar 20 1800 UTC - Mar 22 0200 UTC

Spring QRP Homebrewer Sprint Mar 22 0000 UTC - Mar 22 0400 UTC

CQ WW WPX Contest (SSB) Mar 27 0000 UTC - Mar 28 2400 UTC

FT8X KERGUELEN ISLAND

Kerguelen Island is a French possession situated midway between Africa, Antarctica and Australia. Its weather is harsh, with rain and snow most days of the year. A very inhospitable place, it was last activated in 1995 by FB1LYF.

So there you have it. Keep an ear to the receiver and an eye to the DX spotting networks and you never know. One day you may be able to snag one of the top ten tough ones

Have fun! I'll see you at the bottom end of forty meters.



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Kevin Carey
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Learning about Antennas

earning more about antennas and their selection and utilization is not only fascinating, it is quite useful for getting better reception of the signals we want to monitor. Fortunately, there is quite a bit of information about antennas which is fairly easily available to radio enthusiasts. This month we'll explore some of these resources and what they can teach us about antennas.

Starting Close to Home

At times I plan my *Antenna Topics* columns* to serve as a primer on antennas. Two years ago I offered a six-part series which described how different types of antennas are found useful for different ranges of the radio-frequency spectrum. These columns were: "Antennas Across the Spectrum: VLF and LF" (March 2001); "Antennas Across the Spectrum: MF and HF" (April 2001); and "Antennas Across the Spectrum: VHF, UHF and Microwave" (May 2001).

Then each column in the second half of this series included construction information for a popular antenna design for the bands discussed: "An antenna for Low (and higher) Frequencies" features an active antenna (June 2001); "An antenna for medium and high frequencies" features constructing a Marconi, quarterwave grounded vertical antenna (July 2001); and "An Antenna for VHF and Higher Frequencies" features an axial mode helix antenna (August 2001).

Last year I took a somewhat different approach as described by the titles of the following series: "An Antenna Primer Part I: Definition, History, and Build Your Own Antenna," a random-length wire antenna (February 2002). "An Antenna Primer Part II: Learn Some Antenna Terms, and Build Your Own Dipole Antenna" (March, 2002). "An Antenna Primer Part III: Plus Building Your Own Groundplane Antenna" (April, 2002).

The combination of these two series is a good beginning for learning about antennas, and for some of us this may be as "in-depth" as we wish to go.

Some Courses in Antenna Technology

The ARRL Antenna Book is probably the best technician-level source of information on antenna theory and application. It is not organized as a course, but could easily serve as a text book for an in-depth course in applied antenna technology. In fact it is an optional text for the ARRL's web-based course in introductory antenna design and construction. You can check out this course at their website: http://www.arrl.org/cce/

courses.html#ec009

The book *Practical Communication Antennas with Wireless Applications* by Leo Setian covers antenna theory and some applied information as well. This text reviews the necessary math, and covers antenna theory at a level suitable for an advanced technician level, or a beginning engineering level. The IEEE offers a practical course on antennas based on this book. You can check it out at: http://www.ewh.ieee.org/soc/cpmt/newsletter/200103/ant.html.

At the technician level the Electronics Technician Association offers *The Antenna Book*, a two-volume set for self-study. These books each have a quiz at the end of each chapter and an end-of-book exam. The goal of these texts is to give an understanding of how to install and utilize antennas, with emphasis on antenna systems for TV, MATV, cable, and satellite communications. The ETA has a testing program which can certify the applicant as qualified in several areas of antenna technology. Incidentally, they also offer certification testing in various areas of radio, TV, electronics, and other related-technology areas: http://www.eta-sda.com/products/books.htm.

Testing and certification in antenna technology, as well as many other related areas, is also available from the International Society of Electronics Technicians: http://www.iscet.org/.

Some Useful Technician-Level Antenna Books

The texts referenced in this section are not organized to provide a course, but there is much to be learned by studying them. The *ARRL Antenna Book*, mentioned above, is an excellent source of basic theory, practical information, and a large number of practical antenna designs. Joe Carr's *Practical Antenna Handbook*, provides, as its name implies, much practical information on selecting and building antennas, as well as many different practical antenna designs.

Close to home again is the Grove Enterprises' CD Antennas for Radio Communications. This CD contains both the second edition of Bob Grove's The Antenna Factbook, and the second edition of my own The Antenna Handbook. The Antenna Factbook covers a great deal of interesting and useful information about how antennas function, their construction and utilization. The Antenna Handbook offers chapters on the history of antennas, types of antennas, construction of a wide variety of antennas, antenna maintenance, testing, repair; and more.

For an excellent microwave-antenna handbook very kindly made available by its author without charge try: http://www.qsl.net/n1bwt/contents.htm. The U. S. Marine Corps Field Antenna Handbook is also available without charge at http://www.armymars.net/ArmyMARS/Antennas/Resources/usmc-antenna-hb.pdf. This useful, 192 page book offers broad coverage of both basic theory and practical application.

There are many other technician-level antenna texts available besides those we have space to mention here. Sometimes technician-level antenna books can be found at public libraries or in the libraries of junior colleges or trade schools which have courses in radio technology. Generally they are available from radio supply houses which advertise in *Monitoring Times*. Amazon.com, Ebay.com and Half.com are also good sources.

Some Antenna-Engineering Texts

There are quite a few engineering-level texts on antennas available. Typically these books utilize extensive math and require considerable study to master. It is possible to learn much of practical interest from a few of them by reading the text without dealing with the math. One such book is Gosling's *Radio Antennas and Propagation* which approaches antennas from the perspective of quantum theory. Many antenna engineers consider Kraus's *Antennas*, to be the bible of antenna engineering. Another highly respected antenna text is Jasik's *Antenna Engineering Handbook*, now several times revised by other writers.

Although engineering texts are sometimes found in public libraries, a more likely place to find them is in the electrical-engineering library of colleges or universities which have electrical-engineering departments. They are also available in the bookstores of these institutions as well as on Amazon.com., Ebay.com and Half.com.

Learning by Modeling Virtual and Real Antennas

There are several antenna-modeling computer programs available which allow the user to design antennas which the program will then analyze. EZ NEC and NEC-Win Plus are two popular examples. Once you have entered the data describing the antenna of interest, the program then describes the antenna's functioning. Variables such as horizontal and vertical radiation and reception patterns (with gain level in all directions), feedpoint impedance, performance at frequencies of your interest, and much more are presented.

A lot can be learned about antennas just by mastering and using one of these programs. The

This Month's Interesting Antenna-Related Web site:

This site has lessons and discussions on quite a number of topics in radio and electronics: I counted at least 15 lessons on antennas, or antenna- related topics:

http://www.st-andrews.ac.uk/~jcgl/ Scots_Guide/contents.htm.

ARRL offers a web-based course in antenna modeling; see their website as listed above. These modeling programs are advertised in ham radio magazines, or you can put their names in an internet search engine to find sources.

For hands-on experience in antenna modeling by building actual miniature antennas, check my June 2002 column "Real Antenna Modeling." That column shows how to learn some practical antenna technology by building small, easy to handle antennas, and testing them by receiving VHF, UHF or microwave signals available in your area. This information is also given in my *Antenna Handbook*.

RADIO RIDDLES

Last Month:

I said: "What is over a mile tall, travels faster than a speeding bullet while keeping its feet in the ground, and yet progressively leans forward so much that it eventually topples onto the earth? Hint: It's not a tired, giant Super-radioman."

Well, at low frequencies signals are typically polarized vertically. The wave front a 100kHz signal produces will extend quite a distance upwards from the earth, certainly more than a mile. And, of course, these radio signals travel at the speed of light: faster than any bullet. Because they are vertically polarized they tend to propagate with their bottom end in contact with the ground. Thus they are sometimes said to have "their feet in the ground" as they propagate.

Consequently, unless they are intercepted by an antenna or some conductive obstacle, they continue propagating on around the world. As they continue they progressively lean farther and farther forward in the direction of propagation (fig. 1) until ultimately they are essentially parallel to, and dragging along the earth's surface. When this happens their energy is then dissipated and wasted in the electrical resistance of the earth. Sad, huh?

This Month:

The physical length of one wavelength of the 100kHz signal above is well over a mile. Is this the reason the wave front is over a mile tall?

You'll find an answer to this month's riddle, another riddle, another antenna-related web site or so, and much more, in next month's issue of *Monitoring Times*. 'Til then Peace, DX, and 73.

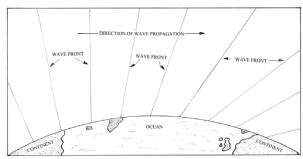


Fig 1. Visualization of the tilting of a vertically-polarized, low-frequency, signal's wave front as it propagates around the earth.

* Reprints are not available on the internet or by e-mail; however, you can purchase in-stock back issues for \$4.75 for the first magazine, \$3.75 for each additional. (Email order@grovent.com to discover availability.) Alternatively, you may wish to purchase an entire year on CD for \$19.95.

If the magazine is no longer in stock, reprints of individual articles may be made for \$3 per article plus self-addressed, stamped envelope. Specify column, title, month, and year. Send to Monitoring Times, 7540 Highway 64 West, Brasstown, NC 28902.

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Continuing with the "All American Five"

ast month, I introduced the "All American Five" a.c.-d.c. set that is our current project. Even though we had worked on a very similar radio, a Philco "Transitone," some time ago, this little RCA 5-tuber presented some restoration problems we hadn't encountered before. It also allowed me to dwell on some of what I called the "human aspects" of radio collecting: the opportunity to revisit one's past, the lure of the quest for just the right piece to complete a project, the fun of the research and detective work sometimes necessary to identify a particular model.

After reviewing some of the problems to be solved in restoring this radio, we began the work by taking a look at the Bakelite cabinet. I had already ordered a new plastic dial window (contact information for the supplier given last month) and done some research on the best way to put a shine on the dull and dirty finish.

Bakelite: A Tricky Material

It turns out that even though this material is really quite tough and hard (so dense, in fact, that most attempts at repairing cracks with glue end in failure), the surface finish is really quite fragile. By way of background, Bakelite is a trade name for a plastic made up of phenolic resins mixed with wood fiber and/or other filler materials. It is shaped into forms such as cabinets by being forced into molds at high temperatures and pressures.

The shiny surface comes from the fact that, when under pressure, the resins tend to migrate to the surfaces in contact with the mold. A crude analogy might be the troweling of concrete. When a slab is first poured, the surface looks discouragingly rough – showing mostly the aggregate (filler). But under the pressure applied during troweling, the finer material migrates to the surface, making a much smoother appearance.

The resins at the Bakelite surface tend to dissolve when subjected to harsh cleaners such as "409" or "Fantastic." One article I came across described how the restorer used such a cleaner on some Bakelite dials and found that the rinse water was running brown. He assumed that this was the residue one often encounters when washing equipment that had been used by a habitual smoker. But when he dried off the dials, it was apparent that they had lost some of their original shine.

Once the high luster of a Bakelite surface is lost, it can't be restored by polishing. What's left underneath is simply too hard for that. Some restorers like to use a coat of paste wax brought to a high shine to simulate the original finish.



Cleaned-up Bakelite cabinet makes a very satisfactory appearance.

Polyurethane varnish has also been suggested by some writers, but I'd worry about the permanence of the adhesion.

The moral: don't use anything stronger than dish detergent (the kind you use in the sink, not your dishwasher) to take the grime off your Bakelite cabinets or parts. What doesn't come off that way can be buffed off with automobile rubbing compound applied with a damp cloth. After that, if you aren't satisfied with the result, you might consider applying a hard wax.

Following my own advice, I washed the little RCA's cabinet in dish detergent and dried it. Then I went over it briskly with Turtle Wax brand automotive rubbing compound, following the directions on the container. I was really quite pleased with the results. While the cabinet certainly didn't look brand new, it now had an allover satiny gleam and reflected the light nicely off its art deco curves.

Mold and Mysteries

Putting the cabinet aside, I turned my attention to the radio chassis. It obviously wasn't going to be the most pleasant set in the world to work on. Although physically complete and almost free of tampering, this radio had obviously been stored for a long time in a shed or garage.

There were no serious rust problems, but the wax-covered capacitors were covered with a deposit that looked like mold. And, remember, this set came to me without a cabinet, so it had likely been stored without one. Its thoroughly grimy condition certainly implied as much. Luckily, a lot of this was loose dust that I took care of with a small new paintbrush that I used as I uncovered various areas during the restoration work.

First order of business would be the usual complete recapping. The old dust-and-mold-

covered capacitors were certainly a sorry-looking lot. I wasn't able to wipe enough of the junk away to read the original markings. However, I found that dampening the capacitors would make the deposits temporarily transparent enough so that I could read through them. In one or two cases, I did have to fall back on the Riders schematic for values – something I prefer not to do if the original caps are present and readable. Often values are changed during production and the documentation doesn't always find its way into

When I studied the schematic in Riders, I found that I didn't have a Model 1AX (chassis number RC1003A) as I had thought. Mine was an apparently previous model, the 1X (chassis number RC1003 – as indicated in Riders and stenciled on my set). Same schematic except for a small front-end change in the 1AX, shown as an inset on the diagram.

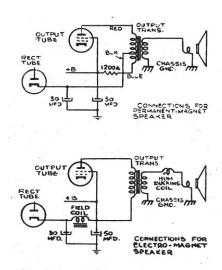
Yet the audio output circuit in my set didn't match that in the Riders schematic for the Model 1X. It showed a PM (permanent magnet) speaker and an output transformer with a tapped primary, while mine has a dynamic speaker (using an electromagnet instead of a permanent magnet) and no primary tap. I went back to my Riders index for the 1X and found another entry – this one in a later volume (14) than that for the original schematic (12).

The volume 14 entry showed a design change that explained the discrepancy. The PM speaker and tapped output transformer of the original design had been replaced with a dynamic speaker and conventional output transformer. I found this to be quite surprising because we definitely think of the evolution of radio speakers as being in the opposite direction. Perhaps RCA had difficulty in finding a reliable source for PM speakers and temporarily reverted to the older type.

Recapping and Rewiring

As I began the work of changing out capacitors, I quickly realized that I was going to have stop for awhile so that I could replace a lot of the wiring. The insulation, probably some sort of rubbery material, had deteriorated and hardened with age to the point where it would crumble to powder at a touch. The worst problems were found between the line of tube sockets and the rear chassis apron, where wires carrying heater and screen voltages — all with the crumbling insulation — ran along together.

The replacement process was a bit tedious, but this is a small radio and the wiring wasn't



Circuit for "PM" and "EM" Speakers in 1X, 12X, and 14X Scries.

Change notice in Riders 14 shows how dynamic speaker (below) was substituted for permanent magnet speaker.

that extensive. I was relieved to find that the i.f. transformer leads were cloth-covered and in decent shape. Pulling the i.f.s apart to get at internal connections would have been really annoying!

Working under the cramped chassis of the small radio, I began to wonder how the assembly-line operators who had put the sets together originally and the service people who had later repaired them managed with the clunky soldering irons of the day. I remember the fat tip of the American Beauty iron I had as a kid. The size of it didn't bother me at the time, but now I was using a modern iron with a pencil tip and finding it a little difficult to keep the heat on the solder joint and away from the insulation of adjoining

I also found myself musing about the obviously hurried assembly techniques that had been used to put the radio together. Often the end of a wire to be connected to a solder lug was simply bent into a hairpin shape and pulled through the lug without crimping it. Of course that made my job of wiring and capacitor replacement much easier. Often I could just melt the solder at a joint and remove the old connection by sliding it out. This was definitely a radio designed to be mass produced for a very low labor cost.

With all of the wiring fixed and capacitors replaced, I finally replaced the cut-off line cord. Remember, these early a.c.-d.c. sets have one

side of the a.c. line grounded directly to the chassis when the power is turned on. To somewhat alleviate this dangerous condition, I used a modern cord equipped with a polarized plug. When inserted into a properlywired a.c. outlet, the wide blade of the plug will be connected to the ground side of the line rather than the "hot" side. So I made sure that it was the lead from the wide blade that would be connected to chassis ground.

After I had located and tested a set of tubes and a pilot lamp to fill the empty sockets of this stripped and cast-off old receiver, the moment finally arrived when I could see the results of my labors. In spite of the radio's sorry original state and the extensive wiring overhaul that had to be done, I wouldn't have been test. The result? It'll need more work. surprised to find that it was now in

working condition. Experience with many previous restorations has led me to expect that careful attention paid to housekeeping issues and capacitor replacement will almost invariably result in a radio that plays the first time.

As a matter of fact, sometimes I feel I'm missing out on the opportunity to conduct interesting diagnoses because the wholesale replacement of capacitors eliminates so many problems in advance. However, this time I won't lack for diagnostic opportunities. After warmup, I could hear no recognizable human sound from the set. Moving the tuning dial throughout its range yielded only a variety of exotic motorboating noises and heterodyne squeals. We'll look into that next time.

To Recap or Not to Recap?

I recently followed a heated discussion in one of the on-line antique radio groups regarding the appropriateness of changing out capacitors. There was quite a lot of feeling that, if an original set of caps was present, they should be left alone and the radio maintained as a museum piece to show the manufacturer's original construction.

I subscribe to this idea - provided one is talking about exceedingly rare equipment from the dawn of radio. But the old capacitors do invariably become leaky over time, and to leave them in certainly impairs the performance of a set – if one indeed has the nerve to try to use it at all. I get my kicks from having my radios perform as closely as possible to how they did

when new.

As far as radios mass produced in the '30s and '40s are concerned, I feel that we know enough about their construction not to need the evidence that might be preserved by keeping the caps. But one point that was made did impress me. We all know how frequent it is to find evidence of amateurish work or mindless modifi-



Here's the little Model 1X all retubed and ready for its first

cation when opening up an old set. A person seeing wholesale capacitor replacement, even if neatly done, might very well distrust the integrity of the radio.

Starting with this little RCA 1X, I'm going to slip a note under the chassis of every set I restore indicating that the capacitors have been replaced strictly in accordance with the manufacturer's original circuit and specifications. I hope such an action will help reassure future owners!

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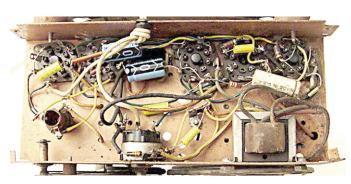
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Underside of chassis after completion of rewiring and recapping.



Bob Parnass, AJ9S

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Furniture Tips & PRO-96 Comments

his column describes the shelving arrangements for my basement radio monitoring post and test bench and shows how to construct a simple portable scanner stand from wood scraps.

Reader Greg Guise uses scanners professionally and tells how his Radio Shack PRO-96 performs in the RF dense Washington, DC, area.

Organizing the Radios at Home

I spent several hours while in graduate school cutting rectangular holes in rack panels for the university club radio station. The club already owned blank rack panels so cost wasn't a consideration. It took a lot of labor and a few skinned knuckles, but the radios and accessories looked great mounted in the panels.

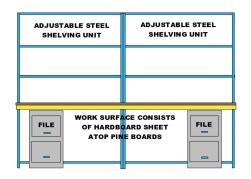
While a rack panel facade is attractive, it is not a good choice for my home radio station. Equipment at the school club station changed infrequently so new panels were rarely needed. Blank rack panels are expensive and cutting the holes for each piece of equipment is time consuming, especially if using hand tools.

My radio gear changes every so often. I enjoy rearranging the equipment frequently, especially when testing new models. I prefer the flexibility and simplicity afforded by keeping the equipment on metal shelves without the encumbrance of a metal rack panel facade.

The radios and accessories sit in adjustable steel shelving units which are open on all four sides. I bought the shelving surplus and it is industrial grade – strong enough to support lots of gear. A depth of 18 or more inches accommodates larger radios and provides space behind them to route cables.

The shelving units assemble akin to the old Gilbert Erector sets popular in the 1950s and 1960s. Bolting adjacent shelving units to each other aligns them and makes them sturdier.

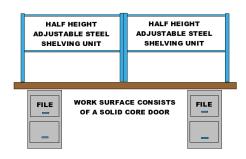
As shown in the accompanying figure, my



home made radio desk consists of two shallow 2-drawer file cabinets supporting a pair of 2 by 10 planks fastened side by side. A layer of 1/4 inch hard board nailed to the top provides a hard work surface for writing. Two coats of Krylon clear lacquer spray seal the hard board against moisture. Strips of 3/4 inch molding (not shown) guard the edges on 3 sides of the desk top, although the molding isn't essential.

The desk top is heavy enough to rest firmly atop the file cabinets without permanent attachment.

The other figure shows the home made test bench I use for equipment evaluation and repair. The shelves hold signal generators, audio analyzers, SINAD meters, CTCSS and DCS encoders, multimeters, etc.



I cut the rails from a full height shelving unit in half to yield two half height shelving units. They rest atop a solid core door, again supported by a pair of filing cabinets.

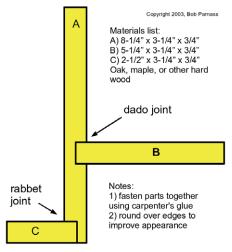
The radio monitor and test benches represent two different designs, but both are constructed of readily obtainable components. The radio monitor station arrangement is better suited to larger installations because you can employ several shelving units and are not constrained by the length of the door used for a desktop.

You can save money by shopping carefully. I bought all the steel shelving at an industrial surplus store. Two of the file cabinets were from a store fixture sale held when a large department store closed. I purchased the other two file cabinets from a used office furniture store.

Portable Radio Stand

Did you ever notice how unstable a hand held scanner is when stood up on end? They are especially wobbly when fitted with a larger antenna.

I use several home made scanner stands for my portable scanners at home. The stands tilt the scanner at an angle for easy viewing.



PORTABLE SCANNER STAND

Woodworking is one of my other hobbies so I built the stands from oak, maple, and walnut scraps instead of bending up a simple metal bookend to serve as a



stand. I recycled some of the wood from the rails of an old discarded bed.

The stands are generally built by cutting 3-1/4" by 3/4" piece of wood into three pieces: 8-1/4", 5-1/4",

pieces: 8-1/4", 5-1/4", and 2-1/2". I design stands large enough to hold my bigger radios, but you can change the sizes to suit your radios.

I cut the dado and rabbet slots in the wood by making repeated passes with a radial arm saw fitted with a common combination blade. You can make them using a dado blade or a router instead.

You don't need any screws or nails. Carpenter's glue holds the three pieces of wood together securely. Be



sure to clamp the pieces together firmly while the glue dries.

To give each stand a finished appearance, I rounded the edges using a router fitted with a round over bit.

Radio Shack PRO-96

The following comments about the PRO-96 are from Greg Guise, an MT reader who uses a PRO-96, BC250d, and other radios professionally as a photojournalist for WUSA-TV. Thanks, Greg, for sharing your evaluation with other readers.

"Just read your fine review of the Radio Shack (GRE) Pro 96.

"... for some, like me, it is more than a hobby. The use of scanner and fixed channel radios allow me to at least be an ear-witness to the news. Few of us, unless embedded in Iraq or in the eye of Isabel (I was 40 miles East of the eye at landfall) have the luck of being an EYE witness to news.

"In the competitive world of big market and network news in Washington DC., good radios are a powerful tool

"All this leads to this: The real world performance of these radios vary greatly from conditions in the lab and on

"Specifically, in side by side tests, using both the 'rubber duck' antenna as well as an 800 MHz 3 dB trunked mounted antenna, the Radio Shack unit outperforms the Uniden BC250d and BC785d most of the time.

"After a month of trial, the PRO-96 hears about 90 percent of transmissions. The Uniden pair about 70 percent. The Radio Shack [PRO-96], as best as I can tell (driving 3,000 miles/month) is somewhat more immune to Nextel and 850 MHz desense. This is true in both the analog and digital modes.



"The PRO-96 is substantially improved over the PRO-95 in the UHF T-band. (Prince Georges County).

"But the best feature is the digital AGC. This is especially noticeable on the new MP-DC 460 MHz digital system. This system has greatly varying audio levels. The PRO-96 outperforms the XTS 300 and 5000 issued to MPD staff (by their own ears).

"In banks with mixed mode operation: i.e. Montgomery, Md. Astro digital system mixed with analog PG fire, the Uniden radios often 'hang up' on the trunked control channel and do not scan the analog channels. The Radio Shack acquires the control channel faster than the Uniden.

"In the extremely high noise floor sections of the District of Columbia such as upper Wisconsin Avenue, the Uniden [models] seem to have better VHF High Band rejection. The Radio Shack [models are] a bit better on UHF 460 and 490 MHz.

"Neither have the RF rejection of my Spectra W-7; however, the Radio Shack comes close unless the desense is from a nearby A side cellular 868 -880 MHz or one of the many Nextel sites.'

Outer Limits continued from page 69

ern accent. (None, but some replies have resulted via the grasscutterradio@yahoo.com e-mail address)

Sycko Radio- By now this one is a veteran pirate station. But, the miscella-neous format on their shows remains difficult to characterize. The station name is pronounced Psycho. (None)

Take it Easy Radio- This veteran pirate took its name from an Eagles rock tune, but they play a variety of rock music, as well as seasonal tunes around holidays. (Uses takeiteasyradio@yahoo.com e-mail)

Undercover Radio- Dr. Benway, still "broadcasting from the middle of nowhere," now features poetry mixed with his rock tunes. (Merlin and undercoverradio@mail.com e-mail)

Voice of the Abnormal- The programming matches the station name on this one; it is liberally steamed in beer. (Elkhorn)

Voodoo Radio- Although this one is not a new pirate, its rock music is back on the pirate bands despite its very sporadic schedule. (Elkhorn)

Voice of Captain Ron Shortwave- Captain Ron's rock and comedy has become a staple on the North American pirate bands. (Uses Captainron6955@hotmail.com e-mail)

WHYP- The James Brownyard's memorial station has been playing original

airchecks of its licensed North East, PA inspiration. (Providence)

WMPR- Their techno rock "dance party" music was supplemented with holiday music at Christmas, but the techno rock remains their primary format. (None)

QSLing Pirates

Reception reports to pirate stations require three first class stamps for USA maildrops or \$2 US to foreign locations. The cash defrays postage for mail forwarding and a souvenir QSL to your mailbox. Letters go to these addresses, identified above in parentheses: PO Box 1, Belfast, NY 14895; PO Box 28413, Providence, RI 02908; PO Box 69, Elkhorn, NE 68022; PO Box 109, Blue Ridge Summit, PA 17214; and Box 159, Santiago 14, Chile. Some pirates prefer e-mail, bulletin logs or internet web site reports instead of snail mail correspondence. The best bulletins for sending pirate loggings with a hope that pirates might QSL them remain *The ACE* (\$2 US for sample copies via the Belfast address above) and the e-mailed Free Radio Weekly newsletter, still free to contributors via niel@ican.net. The Free Radio Network web site, another outstanding source of content about pirate radio, is found at *http://www.frn.net* on the internet.

Thanks

Your loggings and news about unlicensed broadcasting stations are always welcome via 7540 Highway 64 W, Brasstown, NC 28902, or via the e-mail address atop the column. We thank this month's valuable contributors: John T. Arthur, Belfast, NY; Dave Balint, Wooster, OH; Scott R. Barbour Jr., Intervale, NH; Artie Bigley, Columbus, OH; Cachito, Santiago, Chile; Jerry Coatsworth, Merlin, Ontario; Ross Comeau, Andover, MA; Rich D'Angelo, Wyomissing, PA; Bill Finn, Philadelphia, PA; Harold Frodge, Midland, MI; William T. Hassig, Mount Prospect, IL; Harry Helms, Las Vegas, NV; Fred Kohlbrenner, Philadelphia, PA; Terry Kreuger, Clearwater, FL; Kraig Krist, Annandale, VA; Chris Lobdell, Stoneham, MA; Greg Majewski, Oakdale, CT; Larry Magne, Penn's Park, PA; Bill Matthews, Columbus, OH; Bill McClintock, Wellington, OH; Bill Montney; Lachine, MI; Mark Morgan, Cincinnati, OH; Adrian Peterson, Indianapolis, IN; Mike Prindle, New Suffolk, NY; Lee Reynolds, Lempster, NH; Don Ruokonen, Annapolis, MD; Robert Ross, London, Ontario; Martin Schoech, Merseburg, Germany; John Sedlacek, Omaha, NE; Doug Smith, Pleasant View, TN; Ronnie Stroup, Wooster, OH; Ed Walsh, AL; and Niel Wolfish, Toronto, Ontario.

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Flying High with AirNav's ACARS Decoder 2

his month we look at a new offering, ACARS Decoder 2, from AirNay, a leader in software for aircraft flight tracking and monitoring. Then we'll do an update of the world of DRM, Digital Radio Mondiale. So let's get started!

AirNav ACARS Decoder 2

We looked at our first AirNav product many years ago. Since then this company has continued to improve and enhance reception of aircraft position report using the ACARS system. In the past we have looked at numerous AirNav products, including AirNav Suite 4, AirNav Internet Lite, AirNav Selcal Decoder and AirNav ACARS Decoder. This time we'll look at their latest offering: AirNav ACARS Decoder 2.

ACARS Who?

Aircraft Communication Addressing and Reporting System – that's where the acronym ACARS originates. ACARS is a digital mode, which is transmitted by commercial and business aircraft in a range of frequencies around 133 MHz.

The message content varies but usually includes aircraft identification (usually referred to as the tail number), flight number, current position coordinates, estimated future coordinates, aircraft abnormalities and specific aircrew requirements. When received on an AM aircraft radio it sounds like a burst of buzz. Just put "ACARS" into http://www.google.com for lots of background information on ACARS.

ACARS Decoding Development

The first ACARS decoders used the audio output of an airband receiver to feed a hardware Interface Box. The Interface Box took the audio signal and converted it into a data stream of 1's and 0's. This digital stream was then connected to a computer via its serial port. Finally the computer program decoded and displayed it plain language data.

With the advent of faster, more powerful computers and sound cards with greater data conversion capability, ingenious programmers wrote the Interface Box out of the loop. Now the receiver's audio could go directly into the computer via the sound card input.

The first AirNav products were used in just such a manner and decoded and displayed live, off-air ACARS messages. Other software manufactures also took this interfaceless route to ACARS decoding. But AirNav had something more up their sleeve ...the "radioless"

ACARS decoder!

We were first introduced to Internet ACARS by AirNav's Internet Lite a few years

ago in this column. Instead of using the output of a radio, this program connected via the Internet to ACARS receiving stations around

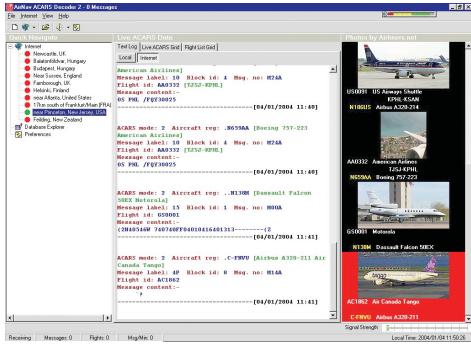


Figure 1 – AirNav's ACARS Decoder 2 Radioless Running with Photos!



Figure 2 – Flight List Grid Display of "Received" ACARS Aircraft

the world. No longer was the listener constrained to receiving ACARS messages from aircraft in the vicinity of their station.

Live or Memorex tm?

That's what the commercial for the famous recording tape once asked. It's now hard to tell when monitoring ACARS via AirNav's ACARS Decoder 2. The user has the option of either using ACARS audio output from his airband receiver or connecting it to the Internet network of ACARS receiving stations.

I still find the capability of displaying ACARS messages from aircraft flying in Europe, USA, Asia or Australia fascinating! In theory you could "hear" an aircraft immediately after takeoff in Europe and then again upon landing in the USA. But the program does not stop with decoding ACARS messages any more. Let's see what else AirNav's ACARS Decoder 2 can do.

Requirements

All it takes to run the program is "MS Windows any version." It ran as well on my old Pentium I 233 MHz as it did on my Pentium III 1Gig PC. The 4.8 Meg file can be downloaded from http://www.airnavsystems.com/ for a one-time cost of \$59.95. After that you are home free with no monthly costs. There is a discount for users of older versions offered on the website.

Download and installation went quickly and without problem. Once downloaded I was receiving Internet ACARS in less than 5 minutes.

AirNav Decoder 2 at Work

Immediately upon looking at Figure 1 you can see a very unique feature of this program. Not only does it decode ACARS messages but it also displays a photo of the transmitting aircraft. These photos come from the Airliners.net database.

In Figure 1 we are looking at three different displays of Live ACARS data coming from the Internet. The user can configure the screen in many different ways. I have the Quick List of Internet "stations" on the left where you can see that we are "listening" to data from a station near Princeton, New Jersey, USA.

The "Text Log," at the center, displays all ACARS information and messages. For example, if you look at the next to the last entry, Aircraft registration N138M, we can see that the aircraft is a Dassault Falcon 50EX. The AirNav Decoder 2 then goes on to tell us that this aircraft is owned by Motorola. Finally the Message content shows position and time information.

The Flight Id, GS0001, is not very useful for private aircraft. However, for commercial aircraft this is where the Flight Number, as seen on your ticket, is displayed. For example, the previous listing is from a commercial American Airlines aircraft Flight Number AA332.

Since we have chosen to display the photos of the received aircraft on the right we can see that actual airplane (second from bottom).

The user can choose to display this data in a number of different ways. Figure 2 displays all the same data on a single line. In this format, routing information is much more clearly identifiable. The four-letter airport codes can be seen for many entries in the last column –"Routing." In this view Message Content is displayed in the lower window when a row is chosen. Using the arrow keys on the bottom frame, the user can navigate to different received aircraft. Notice that in Figure 2 new aircraft have been received since it was captured a few minutes after Figure 1.

What Do I Think?

AirNav Decoder 2 is one of the best ACARS programs I have used. Since it is a new program it does have some bugs. The Internet connection seems to hang up after a few downloads. This requires the user to click off the selected site and then back on. When this is done a large amount of new aircraft data flows to the screen. Also the Help file did not work properly. AirNav is aware of the problems and will be releasing a patch by the end of January 2004.

AirNav also says that their Internet network of stations will be improving their coverage. Currently some of the sites are rarely available and others are not continually available, 24 hours a day, seven days a week.

There is only one modification that I would suggest. With data "flying" in from all around the world it would be very helpful if the exact originating website was recorded in the data. Currently the only "Source" listed in the first column of Figure 2 is either Internet or Local. It would be better to list, for example Princeton, USA, or New Castle, UK. Surprise: That's really my only suggestion, although, of course, cheaper is always better.

DRM Update

I'm sure all the DRMers out there know that a Digital Radio Mondiale transmission format change was implemented on 15 December 2003. Software version 2.0.34 is now REQUIRED to decode DRM signals. Without it you'll hear nothing.

It's interesting that the notice of the new revision from the DRM's Merlin VT advises you "...to save the new versions of the software in a different directory, so you can keep both old and new versions during the transition period." This is always a good idea during beta testing of a software package. But why is it needed for a "ready for prime time" software?

Not all DRM stations are going to change to the new format at the same time. Again according to the email, they "....anticipate a system upgrade transition period of approximately one week, so please don't worry if not all broadcasts are available immediately." That sounds a little like the English joke about changing the side of the road that traffic drives on. In order to ease in the change, cars made the change on the first day and trucks (lorries) and buses on the next day!

To download the new version you will

have to go to http://www.drmrx.org with the password you received with the purchase of your original DRM software. With a file size of 13221 kB, you'll also need lots of patience if you use dial-up. It took me over an hour for the download! If you don't own the DRM software you can purchase it for 60 Euros at the DRM website.

DRM Reader Feedback

In the recent columns on DRM monitoring I wondered what factors were causing my DRM reception problems. Well, feedback from readers seems to point to propagation as the main culprit. One reader monitoring DRM from Antarctica has lots of DRM experience and has witnessed the major effect that propagation has on DRM reception. Readers in North America echo his opinion.

We may have established that propagation is the number one DRM reception killer. Regardless of DRM's goals (and marketing), it's almost expected that fading and multipath will make it very difficult to decode 1's and 0's.

However, for listeners not in the wilds of the South Pole, I still think that noise can be a major factor. Share your DRM experiences by emailing me at *johncatalano@monitoringtimes.com*.

That's it for March 2004. Next time, two programs that I'm sure you'll be interested in for your monitoring or Ham shack will be under the microscope. Till then, keep looking up at the sky!

NOTICE: It is unlawful to buy cellular-capable scanners in the United States made after 1993, or modified for cellular coverage, unless you are an authorized government agency, cellular service provider, or engineering/service company engaged in cellular technology.





Yacht Boy 550PE

by Gayle Van Horn

he recent release of Grundig's new YB-550PE has caught the attention of quite a few hobbyists, and deservedly so. This incredibly attractive addition to the versatile Yacht Boy line combines an AM/FM and shortwave receiver, in a lightweight, compact radio.

The YB-550PE receives all 14 international shortwave bands (shortwave tuning coverage from 1.711-29.999 MHz), AM

broadcast band (520-1710 kHz), and FM broadcast band. A built-in telescopic antenna is used for shortwave and FM, and an internal ferrite bar antenna is used for the AM broadcast band. A mini plug jack on the side of the radio facilitates connection of an external FM or long wire shortwave antenna.

The many tuning aids in the YB550 are a nice feature with six different tuning methods available, including either a direct keypad frequency entry, or the up-down tuning key to

band scan in 5-kHz increments. The side scroll wheel tunes medium wave AM or shortwave stations to 1-kHz increments.

Another nice tuning feature is the Memory Autoscan. Two hundred frequencies can be stored into eight pages of memory. Each page holds 25 frequencies, or you can customize your memory pages from eight to four, five, or 20. This feature proved invaluable for nightly shortwave monitoring.

You can also quickly jump from one broadcast band to another quickly by using the meter band selector button. This was helpful when comparing shortwave band conditions at various listening hours.

Frequencies are displayed in a large backlit LCD, while signal strength is indicated via a five-level graph bar. The radio's back snapon stands proved helpful for table top or "hand-held" listening. The internal speaker provides good, loud and crisp audio. A set of ear buds are included for private listening and stereo reception in the FM mode.



Reception a Pleasant Surprise

Just what can you hear from this portable? Plenty. In our recent test, we observed very good selectivity, with an above average dynamic range for a low end portable. Medium wave reception was remarkably good. Domestic AM band broadcasters, as well as foreign stations from Canada, Mexico and Cuba were audible with good signal strengths.

FM broadcast reception performance was equally as impressive.

My biggest surprise, however, was reception of broadcasters in the 60 and 90 meter tropical bands. While the 550-PE is definitely not a "DX machine," if we compare it to a table top receiver, our reception test in the "trops" found quite a few stations with fair to good signal strengths at levels which were certainly adequate to monitor. Band scans in the 49, 41, 31, 25, 22, 19 and 16 meter bands also indicated better than average signal strengths, perfect for general program listening.

Other features of the YB-550PE include a 12/24 built-in clock, which may be set for either format. An alarm with a snooze feature allows you to wake up to a

preset station or the last one tuned, and a 5-120 minute sleep timer. An optional DC 4.5 V AC adapter is also available for purchase. Other refinements found on the side of the radio include a DX-local switch, tone button, lock switch and fine-tuning.

For shortwave, AM or FM listeners seeking an affordably priced portable, the new YB-550PE is just that. The complete product kit includes a carrying case, owners manual, Shortwave Listening Guide booklet, ear buds, and three AA batteries. The small 10-ounce size, ease of operation, crisp audio, and operation features should interest those seeking a terrific carry-along for travel or a portable pocket radio. The Yacht Boy 550PE is available at select national retailers, including Grove Enterprises (800-438-8155), for \$99.95. For additional information about the Yacht Boy 550PE and additional Eton products, call 1-800-872-2228, or visit http:// www.entoncorp.com.

Sounds Sweet – A Side-By-Side Speaker Comparison

By Bob Grove

Several listening enthusiasts have asked us our impression of a recent addition to our hobby's accessories – the Sounds Sweet speaker. No question about it, original-equipment speakers inside the cabinets of our receivers and scanners leave a great deal to be desired!

At our listening post, we installed a toggle switch between the Sounds Sweet and a typical stereo bookshelf speaker formerly sold by Grove (Grove SPK03: CSI/SPECO DMS-3P) and connected it to an ICOM R8500 wide-frequency-coverage receiver. The Grove is a small bookshelf unit measuring roughly 7 x 4 x 4 inches, while the Sounds Sweet occupies a substantial 12 x 10 x 10 inches.

Let's Listen

Tuning in a classical music station, we weren't surprised that the bass register was better in the much-larger Sounds Sweet, and the sound had more "massiveness." But the vibrancy of upper-register harmonics of the strings was muffled compared to the Grove unit. But the Sounds Sweet isn't advertised for high-fidelity FM broadcast reception, it's intended for shortwave listening and VHF/UHF communications monitoring.

The Sounds Sweet web site is punctuated by advertising claims; let's separate the facts from the hype:

"Dense, solid, tongue and groove construction, tuned port, bass reflex speakers optimized for communications, scanners and shortwave with an EXTREMELY EFFICIENT dual cone driver." (Emphasis theirs)

Editorial comment: We do see a tuned port, but no evidence of a bass-reflex port. The 8-inch speaker certainly does sound considerably better than the internal, original-equipment speaker, as does the Grove speaker. The Sounds Sweet does deliver more audio than the Grove at the same volume control setting.

"Sounds Sweet speakers can be driven LOUD WITH ALL RADIOS, even handheld transceivers and scanners!" (Emphasis theirs)

Editorial comment: Both speakers can, assuming that the radios themselves don't deliver distortion at high volume levels.

"Sounds Sweet communications speakers maximize intelligibility from your transceiver, receiver or portable by reproducing only the communications voice and shortwave music frequencies coming from your SSB, AM or FM communication or shortwave radio."

Editorial comment: All of these modes utilize a reduced audio-spectrum bandwidth, typically 300-3000 Hz. Don't expect bassthumping lows and tinkling highs.



"NO HISS! UNCOMPROMISED communication voice and shortwave music speakers with FULL CLEAR CLEAN audio and NO HISS!" (Emphasis theirs)

Editorial comment: If there's hiss on the signal, you're going to hear it on either speaker. That said, the Sounds Sweet rolls off its high frequencies sooner than the Grove, thus proportionately reducing high-frequency hiss much like turning down a treble tone control. But this also reduces the crispness of the sound which can reduce voice intelligibility and compromises the harmonic richness of music.

♦ The Bottom Line

Since both speakers offer considerable sound improvement over original equipment internal speakers, which is the better buy? That's a tough call. Each speaker accessory has its own benefits under varying listening conditions.

For shortwave enthusiasts who prefer the mellowness of reduced treble along with a moderate reduction in high-frequency hiss, and have the room to enjoy somewhat better bass from the larger speaker and cabinet, the big Sounds Sweet is the clear choice.

For shortwave and scanner hobbyists more interested in retaining voice and music crispness and presence without quite as much bass emphasis, especially listeners experiencing high-frequency hearing loss, we'd recommend the \$50-range typical stereo speaker.

Sounds Sweet, \$99 plus shipping; order

from their web site: http://www.soundssweet.com or write Sounds Sweet, 99 W Shore Dr, Carmel, NY 10512.

Kaito KA1102 Multiband Portable

By Bob Grove

It may be too late for the gift-giving season, but the low price for this new, little gem makes it affordable anytime of the year. Kaito's KA1102 portable, multiband, dual-conversion radio offers a great deal of features and performance in a small package.

Frequency range is 70-108 MHz FM, 522-620 kHz AM, and 3-30 MHz shortwave (direct frequency entry or meter band selection).

Digital readout with nightlight illumination, SSB reception, wide/narrow selectivity, clock/alarm/on-off timer with seconds readout, scan/search for signals, direct-entry keypad, 190 memory channels, stereo FM reception (ear buds included)/recording line output, digital volume and tuning controls, DX/local sensitivity switch, even a news/music tone switch enhance the radio's performance.

Measuring 5-1/2"W x 3-1/2"H x 1"D, the half-pound receiver is powered by three AA cells (battery status indicator is displayed), or a 6-volt wall adaptor (included). A battery-charge provision allows the substitution of optional, rechargeable NiMH batteries.

An indoor wire antenna (included) may be plugged into the 1/8-inch external antenna jack. A strip of four mini-LEDs indicates relative signal strength. A protective, leatherette, drawstring pouch is provided as well.



Let's Listen

Initializing the radio (first power-up) allows the user to choose between 9 and 10 kHz steps for the medium wave AM band. Tabletop listening is assisted by a hinged rear flap which angles the radio comfortably upward, allowing both good viewing angle and stable support.

Medium-wave reception is accomplished via the usual internal ferrite bar, while shortwave and FM stations are brought in by a 28-inch telescoping antenna.

The internal 2-1/2 inch speaker is hardly a thunder maker, but it does a respectable job on voice and music at normal listening volume. In comparison, the ear buds produce

remarkable, room-like ambience with deep bass and crystal-clear highs on stereo FM.

Sensitivity is on par with more costly receivers. Pushbutton scanning for signals is easy, using the same buttons for single stepping or automatic search. Direct frequency entry is intuitive, with the processor inserting trailing zeroes if you ignore them.

The wide/narrow bandwidth really does make a difference reducing adjacent-frequency, medium wave and shortwave interference; it's a true filter-selectivity switch, not merely an audio tone control.

♦ The Bottom Line

This is the closest thing to a "full-featured" shortwave portable for under \$100 that I can recall. Sensitivity, selectivity, digital readout, continuous shortwave-frequency coverage, keypad entry, decent audio, compact convenience, low cost – they're all there.

The Kaito KA1102 multiband portable with all accessories is \$89.95 plus shipping from Grove Enterprises (800-438-8155; http:/www-grove-ent.com; or email order@grove-ent.com)



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VHF - Slim Jim Antenna for 2 Meter Band

By D. Prabakaran

ere is a 2 meter (144-146 MHz) antenna that is inexpensive and easy to build for amateur radio operators compared to other types like the ground plane vertical antenna, Yagi antenna, etc. In India, the frequency band allotted in VHF for amateur radio operation is 144-146 MHz; in the U.S. it's 144-148 MHz.

Generally, antennas works well only when placed over a good ground system. The success or failure of an antenna system often depends on whether or not it has a good RF ground. Poor grounds cause antennas to operate at less than best efficiency. In fact, it is possible to lose between 50 and 90 percent of the RF power by heating the space under the radiation lobe, instead of transmitting into the air.

This is a vertically polarized omnidirectional free space antenna which offers approximately 1.8 dB of gain. It has a radiation efficiency 50% better than a ground-plane antenna due to its low radiation angle, it is unobtrusive, and has no ground-plane radials – therefore low wind resistance and easy to erect.

This antenna is a back feed folded vertical dipole antenna for the 2 m band. The name Slim Jim comes from the slender construction. The Slim Jim vertical angle of radiation is almost parallel to ground so maximum radiation is where it is needed: straight out and all round. With all ground planes, including those with radials an entire wavelength long, the vertical angle radiation is tilted upwards at an angle of 30 degrees or more. This gives the Slim Jim a gain over a 5/8th wave of 6dB when measured parallel to the ground!

The feed is on the base, which causes no problem with the connection between the feeder and the antenna. The feeder impedance is 50 ohm. Slim Jim can be made of aluminum tubing with a diameter of 10mm or 12mm, or a 300 ohm cable. The distance between the two parallel elements is not critical and neither is the length if it is made of 10mm tubes.

The isolation between the two divided halves (halfwave and quarter wave), should be made of pertinax or teflon or a similar isolation material, which fits between the two parts. The use of a 'J' type matching stub (J integrated matching = JIM) facilitates feeding the antenna at the base, thus overcoming problems of interaction between feeder and antenna. The feed impedance is 50 ohms.

Basically, it is an end-fed folded dipole

operated vertically. The matching stub provides a low impedance feed point (50 ohms) at the base and couples to the antenna section at high impedance at one end. As with all folded dipoles, the currents in each leg are in phase, whereas in the matching stub they are in phase opposition, so little or no radiation occurs from this. Correctly matched, the VSWR (Voltage Standing Wave Ratio) will be much less than 1.5:1, and remains so across the band.

A slip sleeve made from copper can be added to the element above the gap for tuning purposes, although the average length of the gap and spacing between the elements is 3" at 72 MHz and 1" at 220 MHz. No part of the antenna should be grounded to the tower or mast. The recommended mount is the use of PVC pipe and PVC pipe "T's." Make sure the space between the tower or mast and the antenna is one "freespace" 1/4 wavelength.

Stand upright (on a railing, etc. but clear of metal water tanks, drainpipes, etc.) and fit the coaxial cable to the antenna with some alligator clips. Attach about 2 inches up from the bottom and check the VSWR. Adjust the clips up or down to get the best match (mine managed 1.2:1), mark where they are to go, remove the clips, and solder the coax directly. Use the copper sleeve, if added, for any necessary tuning.

Feed line coax cable consists of two concentric wires, as shown in the figure. It is important to note that coax cable is unbalanced; no current flows on the outside shield of the cable. Always use good quality low loss type coaxial cables to feed RF energy to antenna from transmitter. RG-8/U and RG-11/U Foam type cables are good choices and

102 MM

cables are good choices and preferable.

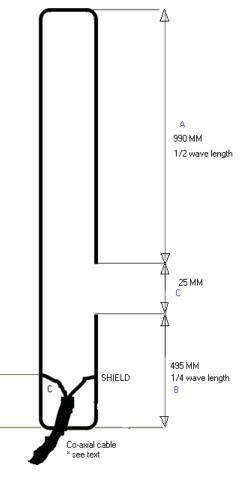
Bad connections cause loss. If you are going to solder connectors on the ends of your coax, be sure to do it right. You must have the right tools. Most CBers and Ham radio operators think they can solder connectors on to coax with their 25

Watt pencil tip soldering iron. You can't. You should use a high wattage iron, preferably over 100 watts. You must heat the connector up quick, so you don't damage the coax and connector, and the only way to do this is with a high wattage soldering iron.

For antennas mounted outside, don't forget lightning-induced damage protection. The

minimum is to never use them in weather likely to produce lightning, and disconnect and ground them when they are not in use.

> Lecturer - Mechanical Eng. N.L.Polytechnic College Tamilnadu, India prabakar10@yahoo.com



This is your equipment page. Monitoring Times pays for projects, reviews, radio theory and hardware topics. Contact Rachel Baughn, 7540 Hwy 64 West, Brasstown, NC 28902; email editor@monitoringtimes.com.

Milcom continued from page 65

Handheld Unit Alinco DJ-X3T	Stock No SCN11	\$209.95
Alinco DJ-X10T	SCN01	\$319.95
Alinco DJ-X2000T	SCN10	\$499.95
AOR AR-8200 Mk III	SCN51	\$589.95
Icom IC R-3	SCN07	\$449.95 (Call for special promotional pricing)
Icom IC R-5	SCN02	\$199.95 (Call for special promotional pricing)
Icom IC R-10	SCN04	\$349.95 (Call for special promotional pricing)
Uniden BC-250D	SCN40	\$349.95 (Optional APCO-25 card \$299.95)
Uniden BC-296D	SCN42	\$524.95 (Includes APCO-25/trunking capability)
Yaesu VR-500	SCN06	\$324.95

Air Show Listening Tip: If you are going to use a handheld scanner at the air show there is another purchase you should consider - an extra set of charged batteries. Murphy's law applies here and nothing is worse than having your batteries die half way through the show with no replacement.

Base/Mobile Unit AOR AR-3000AB AOR AR-5000A+3B AOR AR-8600 Mk II Icom IC R-8500	Stock No. SCN26 RCV44P SCN11 RCV14	Price \$1099.95 Awaiting FCC certification \$889.95 \$1499.95 (Call for special promotional pricing)
JRC NRD-545	RCV21DS	\$1799.95 (Must order the optional ACC11DS VHF-UHF converter at \$349.95)
Uniden BC-785D	SCN41	\$309.95 (Base/mobile) (Optional APCO-25 card \$299.95)
Uniden BC-796D	SCN43	\$524.95 (Includes APCO- 25/trunking capability)
Yaesu VR-5000	RCV51	\$889.95
Computer Receivers Icom PCR-1000	Stock No. RCV45-BON	Price \$399.95 (Call for special pro- motional pricing)
WinRadio WR-1550e	RCV47-E	\$549.95
WinRadio WR-1550i	RCV47-I	\$499.95
WinRadio WR-3150e	RCV48-E	\$1849.95
WinRadio WR-3150i-DSP WinRadio WR-3500e	RCV48-I RCV49-E	\$1849.95 \$2395.95
WinRadio WR-3500i-DSP	RCV49-E RCV49-I	\$2395.95 \$2395.95
WinRadio WR-3700e	RCV50-E	\$2895.95
WinRadio WR-3700i-DSP	RCV50-I	\$2895.95

Finally, I would like to extend a hearty thanks to the over 200 contributors who took the time to share their post show reports with us during the last year. I deeply appreciate the time and effort each of you took to let us know what you were hearing.

During the 2004 season we want to hear from any of our readers who attend any of the air shows listed below. We hope you pass along any and all frequencies you monitored during the show even if they are on the list above. If you attend an air show this year, please pass along what you hear! You can reach me via e-mail at larry@grove-ent.com or you can write us at: Milcom, 7540 Highway 64 West, Brasstown, NC 28902.

Until next month, 73 and good hunting, all.

Military Jet Demonstration Teams 2004 Performance Schedule

Note: Participation of the teams below at a variety of locations is still pending. Note also that should Security Levels increase beyond Threat Condition "Bravo," many military installations will not have public air shows. Consequently, demonstration schedules dates listed below are subject to change or cancellation without notice.

Group Abbreviations:

BA=USN Blue Angels SB=Canadian Snowbirds

TB=USAF Thunderbirds

Base Abbreviations

ACC Air Combat Command

AFB	Air Force Base
ARB	Air Reserve Base
CFB	Canadian Forces Base
JRB	Joint Reserve Base
MCAS	Marine Corps Air Station
NAF	Naval Air Facility
NAS	Naval Air Station

NAF NAS	Naval Air Facility Naval Air Station
Dates	Group: Locations
Mar 13	BA: NAF El Centro, CA
Mar 20-21	BA: NAS Lemoore, CA
Mar 27-28	BA: Tyndall AFB, FL; TB: Punta Gorda, FL
Apr 3-4	BA: MacDill AFB, FL
Apr 4-5	TB: Eglin AFB, FL
Apr 17-18	BA: NAS Meridian, MS; TB: San Diego Beach, CA
Apr 24-25	BA: MCAS Beaufort, SC; TB: March ĀRB, CA BA/SB: Fort Lauderdale, FL; TB: Millville, NJ
May 1-2	BA/SB: Fort Lauderdale, FL; TB: Millville, NJ
May 8-9	BA: NAS Atlanta, GA; TB: Lake City, FL; SB: Vidalia, GA
May 12	SB: Dobbins ARB, GA
May 14-16	BA/SB: Andrews AFB, MD
May 15-16	TB: Dover AFB, DE
May 18	SB: Grande Valle, PQ
May 22	TB: Charleston AFB, SC
May 22-23	BA: NAS Kingsville, TX; SB: Summerside, PEI
May 23	TB: Langley AFB, VA
May 26 May 29-30	SB: Nunavut, NU BA: Calverton, NY; TB: Moffett Field, CA; SB: Riviere Duloup,
May 27-30	PQ
Jun 5-6	BA: Myrtle Beach, SC; TB: Maxwell AFB, AL; SB: CFB
	Winnipeg, MB
Jun 9	SB: Virden, MB
Jun 12	TB: Hill AFB, UT
Jun 12-13	BA: Bermuda
Jun 13	TB: NAS Fallon, NV; SB: CFB Moose Jaw, SK
Jun 16	SB: Hanover, ON
Jun 19-20	BA: Oklahoma City, OK; TB: Quonset Point, RI; SB: Sarnia,
	ON
Jun 23	SB: St. Isidore, PQ
Jun 24	SB: St. Georges, PQ
Jun 25-27	SB: London, ON
Jun 26-27 Jul 1	BA: Elmendorf AFB, AK; TB: Janesville, WI
Jul 3-4	SB: Ottawa, ON BA: Traverse City, MI; TB: Kansas City, MO; SB: Muskegon,
3010-4	MI
Jul 9-10	BA: Pensacola Beach, FL
Jul 10-11	TB: Binghamton, NY
Jul 17-18	BA: Rochester, NY; TB/SB: CFB Cold Lake, AB
Jul 21	BA: Rochester, NY; TB/SB: CFB Cold Lake, AB TB: Cheyenne, WY; SB: Inuvik, NT
Jul 24	SB: Yellowknife, NT
Jul 24-25	BA: Peoria, IL; TB: Fairchild AFB, WA
Jul 25	SB: Peace River, AB
Jul 28	SB: Watson Lake, YT
Jul 31	SB: Williams Lake, BC
Jul 31-Aug 1	BA: Helena, MT; TB: Mt. Comfort, IN
Aug 1	SB: Kelowna, BC
Aug 4	SB: Wetaskawin, AB
Aug 7-8	BA: Seattle, WA; SB: Lethbridge, AB SB: Vancouver, BC
Aug 11 Aug 13-15	SB: Abbotsford, BC
Aug 14-15	TB: Westover ARB, MA
Aug 21-22	BA: Chicago, IL; TB: Offutt AFB, NE; Saskatoon, SK
Aug 25	SB: Lynn Lake, MB
Aug 28-29	BA: Niagara Falls, NY; TB: Toledo, OH; SB: St. Catherines,
•	ON

Sep 1 SB: Brantford, ON Sep 4

TB: Ellsworth AFB, SD Sep 4-6 BA: St. Louis, MO; SB: Toronto, ON

Sep 11 TB: Anderson AFB, Guam Sep 11-12 BA/SB: CFB Shearwater, NS Sep 14 TB: Kadena AB, Japan Sep 15 SB: Pictou, NS

Sep 16 TB: Kunsan AB, South Korea Sep 18-19 BA: Nantucket, MA; SB: Sherbrooke, PQ

Sep 19 TB: Osan AB, South Korea

Sep 25-26 BA: NAS Oceana, VA; TB: Hyakuri AB, Japan; SB: McConnell ARB, KS

SB: Tucumcari, NM Sep 29 Sep 30 TB: Misawa AB, Japan Oct 2-3 BA/SB: Salinas, CA Oct 3 TB: Hamamatsu AB, Japan Oct 9-10

BA: MCAS Kaneohe Bay, HI; TB/SB: Redding, CA

Oct 15 SB: CFB Moose Jaw, SK

Oct 16-17 BA: MCAS Miramar, CA; TB: Houston, TX BA: NAS/JRB New Orleans, LA; TB: El Paso, TX BA: NAS Jacksonville, FL; TB: Lafayette, LA Oct 23-24 Oct 30-31

TB: Camden, SC Nov 6 Nov 6-7 BA: Key West, FL TB: Seymour-Johnson AFB, NC Nov 7

Nov 13-14 BA: NÁS Pensacola, FL; TB: Nellis AFB, NV E GADGET GUY

PC NoteTaker[™] – The next "killer app?"

recent news story said, in essence, about 66 million Americans go online and, when they do, the thing they do most is send and receive email. So there's a pretty good chance that many of the people who read this column have computers and use email.

In my view (and I've been using computers since 1980), email is very, very cool. It's what computer types refer to as a "killer app," an application that is soooooo useful that once you try it, you can't imagine how you could get along without it. Computers do a lot of useful things such as word processing, email and so forth, but there is one area in which they are weak: the ability to sketch out an idea and quickly share it with someone.

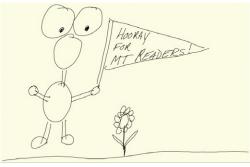
For example, suppose I was chatting one day with our good editor, Rachel Baughn, and the two of us began discussing maybe having a cartoon or something that would express our appreciation of MT readers. We could discuss the cartoon in words via email, or over the phone, or we could fax sketches to each other or we could make sketches and then scan them or digitally photograph them and then email the result, or we could even use digital drawing programs – but the whole thing would get kind of cumbersome after a while and not very attractive. What is really needed is some means of making a note or sketch and easily transmitting it.

Take Note

And that's precisely where PC NoteTaker from Pegasus America comes in. It's designed to quickly capture handwritten notes and drawings and make them instantly accessible on your personal computer. And, by golly, if it doesn't do exactly what it's supposed to do!

PC NoteTaker is almost dirt simple. It consists of three elements. The first is the "base unit," which looks for all the world like the clip off the top of a clipboard. There's a wire attached to the base unit and it plugs into a USB port on your computer. The second element is a digital pen that takes three button size batteries and a special refill. The third element is PC NoteTaker software that installs on your PC. It requires 15 MB of hard disk space; Windows 98, ME, 2000 or XP; a minimum of 32 MB of RAM, and Internet Explorer 4.0 or higher.

Once you install the software and connect the base unit to your computer, simply clip the base unit to an ordinary pad of paper and begin writing on the paper with the PC NoteTaker pen. Instantly, your handwritten note appears not just on the paper (in ballpoint ink) but also on your computer screen. My ten-year-old son, who has been using computers since before pre-school, took one look and said, "Wow, cool!" Even better,



I created this cartoon with PC NoteTaker. It appeared instantly on the screen.

with a bit of practice and judicious use of the software, you can create sketches in different colors.

Custom Apps

With just a click of a button on the PC NoteTaker software, you can send your note, sketch or doodle via email, attach it to a document, and/or save it for future use. You can attach handwritten notes to applications such as Microsoft Word and Powerpoint, create "sticky" notes by dragging and dropping, and copy and paste into other programs.

Or – and this is really neat – you can even create a notes reminder that will cause the note to reappear at a specified date and time. This could be extremely handy if notes have the habit of disappearing on your desk as they do on mine. I normally start my week with a fairly clean desk, but by half-past Tuesday, the debris on my desk can be pretty severe. So when I'm in the middle of an interview, and a buddy calls, I scribble a quick reminder to call him back. The note, of course, promptly runs away and hides. But with PC Note Taker, the note can pop up on my screen to make sure I don't forget.

The Verdict

I think PC NoteTaker is really neat. It's a powerful tool for communicating, collaborating with others and being creative. Even if you are a "power typist" like me, it fills a unique hole in the tools that your computer offers. And if you prefer to take notes by hand . . . well, PC NoteTaker is just that much more useful. Is it the next "killer app?" It just might be.

PC NoteTaker's suggested price is about \$80. For more information, call 925-226-3490 or visit http://www.pegasusamerica.com.



PC NoteTaker consists of the base unit/clip, a digital pen, and PC NoteTaker Software.



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What's NEW

Tell them you saw it in Monitoring Times

Double Bazooka Antennas

The Double Bazooka antenna design from International Antenna Corporation is a broadbanded half wave antenna design first conceived as a radar antenna in the early 1940s for use by the U.S. Government. It was modified for amateur radio use in the 1950s. The IAC design provides an antenna that will endure harsh elements better than homebrew designs. Its Mil-Spec quality construction is used by amateur radio volunteers and SWLs and comes in a variety of configurations

All IAC antennas feature a SO 239, a silver plated connector having Teflon insulation and a gold plated socket. The features of the proprietary design anchor the connector in high shear UV resistant molding. The coax element is sealed in this molding. Mil-Spec heat shrink tubing, with a melting inner liner, it seals and relieves strain between the coax and the twin lead. A heat shrink cap is applied to the outermost end of the twin lead. This unique design eliminates the need for antenna matching baluns and can be fed directly with 50 Ohm coax.

IAC's newest design is the Shorty – a shortened half wave dipole 65% of the overall length of the standard Double Bazooka. Antenna construction centers around two center loaded wide spaced high Q coils that feed into 50 Ohm coax in combination with 300 Ohm transmission line end sections. The end result is a center fed broadband shortened dipole antenna. The Double Ba-



The Shorty Bazooka

zooka Shorty antenna will handle full legal limit power with no effect to performance. All Shorty antennas will operate on other bands with the aid of an antenna tuner.

Another model of interest to MT readers is the Shortwave Broadcast Listening Bazooka antenna which also uses 50 Ohm



coax in combination with 300 Ohm transmission line end section to form an end fed broadband quarterwavelength antenna. The Shortwave Broadcast Listening Bazooka antenna is recommended to be mounted to a



secure point such as a roof peak or metal pole for optimum results. The Shortwave Broadcast Listening Bazooka antenna will cover the 13 through 120 meter shortwave bands.

The Standard Double Bazooka antenna comes configured for 17, 20, 40, 60, 80, and 160 meters and can be used in array formation. Prices range from \$116 to \$214. The Double Bazooka Shorty covers 40, 80, or 160 meters and costs from \$129 to \$229 (on sale at half that price at press time). A half-sloper model covers 20, 40, 80, or 160 meters and costs from \$100 to \$140 (20 and 40 meter models were on half price sale). The SW Broadcast Listening Bazooka covers 13 through 120 meters and costs \$99 but was on half price sale at \$49 at press time. Prices do not include shipping. IAC's version of a stealth Bazooka comes in the form of a flag pole for \$329.

International Antenna Corp., P.O. Box 121430, Clermont, FL 34712; 888-268-4214; http:// www.iacantennas.com

Mobile Speaker

Road noise is always a factor when it comes to clear communications reception in a vehicle. Whether your mobile listening needs are for scanner, shortwave, ham radio, CB, or professional two-way communications, the Valor Classic VS6 mobile accessory speaker will improve audio reception using noise canceling technology. A simple snap of the toggle switch reduces pulse ignition noise and background hiss. Enjoy improved audio with the rugged, 4-inch, 10watt-rated speaker. Mount the adjustable, steel bracket to your vehicle, plug the 10-foot cord into the 1/8" (3.5 mm) external speaker jack on your radio, and you're ready to go! The Valor Noise Canceling Speaker is \$14.95 plus shipping from Grove Enterprises (http://www.groveent.com, call 1-800-438-8155, or write 7540 Hwy 64 West, Brasstown, NC 28902)

462 MHz Pager Interference Filter

Paging interference at 462 MHz is a growing problem among scanner listeners as well as two-way communicators. PAR has responded by releasing this improved notch filter featuring a factory-tuned triple cavity, providing razor-

sharp, steep rejection of 462 MHz paging interference (3 dB band-



width +/-2.5 MHz), while providing flat, virtually unattenuated response from DC through 1.3 GHz. This commercial-quality filter can be ordered with either BNC (standard) or N connectors. \$69.95 from Grove Enterprises (see above).

Digital Voice Communications

Love it or hate it, digital tehnology is here to stay, and amateur radio is doing its part, not only to remain on the cutting edge, but also to make new digital modes accessible to hobbyists. Drawing from the best of the analog and the digital worlds, Alinco's engineers have applied a new digital compression technique to the human voice that is

compatible with narrowband 10F3 GMSK direct modulation. It uses conventional data rates and bandwidths that fit into today's existing band plans. The entire system is optimized for the audio range of the human voice to improve audio quality and bandwidth.

Alinco's new EJ-47U digital voice communications module is an option for use in the Alinco dual-band DR-620 VHF+UHF and the DR-135MKII mobile/base transceivers or in the DJ-596 and DJ-593MkII VHF/UHF Handi-Transceivers. The PC board lists for \$195.95. Transceivers are easily switched between digital and analog modes, since digital communications are only possible between transceivers using the same digital mode.

Klingenfuss 2004 Shortwave Frequency Guide

Joerg Klingenfuss

The revised Eighth Edition of the 2004 Klingenfuss Shortwave Frequency Guide, has recently been released, and as with previous editions, it is a gem. This book covers the latest frequencies for utility, domestic, international and clandestine broadcast stations, compiled by an international contributing staff. Features include articles on Digital Radio, Monitoring Utility Stations, and the by-frequency listings of util-

What's NEW

Tell them you saw it in Monitoring Times

ity radio stations.

Utility and broadcast stations are arranged by-frequency, and list start/end time order and location. The broadcast section includes the language, target areas and a remarks field. When using this by-frequency method, listeners can instantly narrow

down identification of any station among those transmitting on a frequency at a given time. This is a great aid and quick access during a DX session



or for a program listener.

Hobbyists may also find the same frequency and format information in the by-country section, *Alphabetical List of Broadcast Stations*. This section is invaluable when focusing on a particular county to monitor.

Unfortunately, the 2004 Shortwave Frequency Guide does not include longwave, medium wave, FM or TV. Nor does it include station info, addresses or websites – something Mr. Klingenfuss should consider for future editions.

Frequency information, as well as parallel frequencies, appear to be accurate, but as with other publications, will only remain accurate until a seasonal frequency adjustment.

My DXing sessions make use of this publication, as it compliments others I use as a reference, and I would recommend it to those seeking such a reference.

For ordering information, consult Universal Radio, Inc. at http://www.universal-radio.com. It is available as book #2841, \$34.95, or write to Universal Radio Inc., 6830 Americana Pkwy., Reynoldsburg, OH 43068-4113. Ordering or additional product information may be found at http://www.klingenfuss.org.

- by Gayle Van Horn-Freq Manager

Getting Sirius over Satellite Radio

Subscribers to Sirius satellite radio who want to listen to Sirius broadcasts in their home may not always have an easy time finding a mounting location with 24-hour reception. TERK Technologies offers a 50-foot extension cable for use with the stock antenna provided with the subscriber's receiver for better access to a roof or window. However, TERK has also designed its own high-performance outdoor



antenna designed specifically for satellite radio reception in the home. The TERK SIR6 is a compact, weatherproof antenna with mounting options for wall-mount, roof-mount, or mast application.

XM Commander

For satellite reception on the road, TERK Technologies also offers an XM satellite radio system for mobile use. XM Commander includes the Commander (digital display unit), a hideaway tuner box, low-profile micro antenna, remote controller, necessary cables, relay switch, and mounting accessories. Audio is through the car stereo using FM modulation or direct-connect RCA line-out.

The XM Commander features the only dual line XM dis-

play available on the market, direct channel entry and 30 presets, TuneSelect which finds your favorite songs, and the smallest satellite radio antenna available. Street price is around \$160 for





the complete installation (not counting the subscription to XM, of course). Check http://www.terk.com for local or online dealers of TERK products.

Amateur Radio Today

The American Radio Relay League has an inexpensive 6-minute video presentation entitled Amateur Radio Today which is available for use as a recruiting tool and an effective way to present the good work done by radio amateurs. The video is also useful for encouraging radio amateurs to become more involved in public service.

The video is narrated by former CBS news anchorman Walter Cronkite, KB2GSD, and produced by a team led by Dave Bell, W6AQ. Video highlights include: ham radio's response on September 11, 2001; ham radio's part in helping various agencies respond to wildfires in the Western US during 2002; ham radio-in-space educational initiatives.

The presentation is avail-



able from the ARRL as a free download (http://www.arrl.org/ ARToday/) or for \$6 on CD or DVD (includes low and high resolution, plus low resolution with subtitles or open captioning), a VHS-format videotape, or as extended viewing "loop" videotape for public displays. Contact American Radio Relay League (ARRL), 225 Main St, Newington, CT 06111-1494; phone 1-860-594-0200.

What's Not New?

For everything related to older scanners, keep G&G Communications on your contact list. These are the folks to see for scanner and pager repairs and used scanners and pagers. In fact, Gerry Oliver says they are selling off some of their collection on Ebay. Check the Ebay or G&G websites for current auctions of old scanners and parts – maybe you'll find a needed "parts radio" or missing radio for your own collection.

The website is a wealth of information, including a list of all known scanners (over 400), repair and modification information, and a list of older scanner and pagers Gerry is looking to buy – working or not. Contact G&G Communications, 7825 Black Street Rd., LeRoy, N.Y. 14482; Phone: 585-768-8151 / Fax: 585-768-7175; E-mail - ggcomm@iinc.com or http://www.iinc.com/ggcomm/

Books and equipment for announcement or review should be sent to "What's New?" c/o Monitoring Times, 7540 Highway 64 West, Brasstown, NC 28902. Press releases may be faxed to 828-837-2216 or emailed to Rachel Baughn, editor@monitoringtimes.com

WXSATs Plan for the Future

n the previous two editions of this column I have introduced coverage of the long term plans to converge the two weather satellite (WXSAT) constellations of the civilian and military programs, NOAA and DMSP, into NPOESS (National Polar-orbiting Operational Environmental Satellite System). As explained briefly last month, it does not end with NPOESS; Europe's new polar system METOP (not yet launched) is to combine with NPOESS in an Initial Joint Polar-orbiting Satellite System (IJPS).

The whole long-term project – NOAA and DMSP to NPOESS and on to IJPS – would take a major feature to cover adequately. But with the significant changes planned to matters such as transmission frequencies, I believe it is important to be aware of the end goal.

Later this decade, launch and operations of the remaining POES and DMSP spacecraft will cease. The NPOESS spacecraft are scheduled for launch beginning in early 2009, by which time NOAA and the US Air Force are expected to have exhausted the satellites currently under production. Satellite operations for NPOESS will be conducted from Mission Management Centers located at NOAA's SOCC and at Schriever Air Force Base. Full operational capability of the NPOESS constellation is expected by 2013.

The first polar-orbiting Metop satellite will be operated by EUMETSAT (European Organization for the Exploitation of Meteorological Satellites). It is on schedule for launch in 2005. There will eventually be one POES, one Metop, and two DMSP satellites in four orbital planes. The first converged NPOESS satellite must be available for launch by 2008 to back-up the last launches of the current DMSP and POES satellites

♦ Testbed LRIT Image

Figure 1 was processed for me by David Taylor. It is a GOES-12 visible channel 01, and Dave has re-sampled it horizontally so that the aspect ratio is 1:1 (square pixels). Dave down-



Fig 1: LRIT image from GOES-12 from David Taylor

loaded the test data from the NOAA Web site – see link below – and made a simple program to convert it into a viewable form.

"The test program uses elements from the software that I have developed for MSG-1 and which has been widely used during the trials. I view the program as a testbed, just to prove that the NOAA LRIT data is readable and see what similarities and differences exist compared to the MSG-1 LRIT data. A full program would have all the data management aspects of the existing MSG Data Manager program."

My thanks to David for supplying me with this first LRIT image. Next month's edition should include an official NOAA LRIT image made available by Charlie Vance. http://noaasis.noaa.gov/ LRIT/htmfiles/ltdata.html

WEFAX (the predecessor to LRIT) will be discontinued on GOES-East in the fall/winter of 2004. For GOES-West, the time frame is spring/summer 2005.

♦ FengYun over Grand Canyon

Chuck Vaughn recorded a most interesting image from Feng Yun-1D as it passed over his location in December. It shows an enhanced image of the Grand Canyon and the surrounding area. Of particular interest is the long white streak that at first glance looks like a cloud; however, Chuck points out that it must be snow because it appeared in the image the following day, and terrain can be seen through most of it. http://www.aa6g.org

Non-weather Satellite Transmissions

Although I do spend the majority of my satellite monitoring activities with the WXSATs, I originally set out to monitor other satellites that transmit near the 137 MHz band. My interest started with the British education and amateur radio satellites of the UoSAT series (University of Surrey, UK) that transmit very easily decoded

Satellite	Freq MHz	Launch
Transit 5B-5	136.65	1964
Solrad 7B	137.80	1969.
ERS-15		
(a.k.a. Secor-7)	136.44	1966.
Ov 5-3	136.26	1967.
ISIS-1	136.41	1969.
S69-4	137.41	1969.
Timation-2		
(a.k.a. OPS 7613 P/L 1)	137.38	1969
Nimbus-4	136.50	1970.
Shinsei	136.695	1971.
NOAA-9	136.77	1984.
NOAA-11	137.77	1988
Orbcomm (various)	137.20 -	
, ,	137.80	

scientific data. From Larry Van Horn's book on satellite frequencies, *Communications Satellites*, I progressed to explore the (then) large number of older satellites still transmitting in the 136 - 138 MHz band. If you have a scanner, give a listen to some of the satellites listed in the table below.

My thanks to Mike Kenny of Melbourne, Australia, for providing a list, of which these are just a selection.

Current WXSAT status and Frequencies

APT:

NOAA-12 and -15 trans. APT on 137.50 MHz NOAA-17 transmits APT on 137.62 MHz.

APT - automatic picture transmission: an unusual form of signal modulation in which the original picture is sampled in real-time into individual lines containing brightness information (cloud is white and sea is dark) and this is amplitude modulated on to a 2.4kHz carrier. This modulated carrier is then frequency modulated on to the final 137 MHz band radio carrier to which we tune our receivers. The receiver extracts the 2.4 kHz (sub)-carrier for later processing and display. The signal can be heard because 2.4 kHz is within our audio range.

Note: In previous years there have been additional APT satellites called Meteors, operated by the Soviet Union. No more of these launches are planned, but co-operative projects such as Meteor-3M are operational, but do not transmit APT.

HRPT/CHRPT:

NOAA-12 and NOAA-16 transmit HRPT on 1698.0 MHz

NOAA-14 and NOAA-17 transmit HRPT on 1707.0 MHz

NOAA-15 transmits HRPT on 1702.5 MHz FengYun-1C and FengYun-1D transmit CHRPT on 1700.4 MHz

HRPT is a digital signal containing the full resolution (1.1km) data stream and therefore requires the higher (1700 MHz) band. NOAA satellites transmit five channels of data; the Chinese satellites transmit 10 channels.

Geostationary WXSATs:

GOES-10 (west) and GOES-12 (east) use 1691 MHz for WEFAX. GOES-12 is currently transmitting LRIT data at 45 minutes past each hour.

Notes

Sounds like musical tones.



Fig 2: Fengyun-1D from December 16, 2003 Grand Canyon from Chuck Vaughn

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If history repeats itself, and the unexpected always happens, how incapable must Man be of learning from experience.

— George Bernard Shaw (1856 - 1950)

Interoperability: Being Responsible

By Larry Van Horn, MT Assistant Editor

It always seems to take a major disaster to highlight radio incompatibility issues that plague this nation's public safety community. This was dramatically highlighted on September 11, 2001, during the terrorist attacks in New York, Washington, and Western Pennsylvania. The battle cry of the public safety officials involved in these disasters was they could not communicate with any other agencies due to a lack of radio compatibility.

More than a decade ago the Association of Public-Safety Communications Officials Project-25 (P-25) protocol established one digital standard to help ensure that communications gear, regardless of equipment manufacturer, would be interoperable for police, fire and other emergency responders at all levels of government. As we wind the clock forward since the 9/11 disaster we have seen a heavier emphasis on rolling out Project 25-compliant systems city-wide, county-wide, state-wide and nation-wide under the mantle of homeland security.

However, despite this heavy interest and the promise of agencies being able to communicate with each other using the P-25 protocol, we still see new digital systems in portions of this country switching to non-P-25 compliant communications systems. Are the taxpayers of these jurisdictions being well served and their taxes well spent? In a word, no!

New Realities Require New Strategies

Movement toward interoperability appears to be moving smoothly on the federal level. The Federal Emergency Management Agency recently announced that the government's wireless efforts are being consolidated into Project SafeCom to ensure that all emergency workers have access to interoperable equipment based on the P-25 standard. The Defense Department has adopted a P-25 compliance policy for land mobile radio systems as have a number of federal agencies, most recently the National Fire Association.

Secretary of Homeland Security Tom Ridge announced in March 2003, that nearly \$600 million in taxpayer funds has been made available to states and U.S. territories to better assist state and local public safety and law enforcement personnel to help them prevent and respond to terrorism. Interoperable radio communications equipment is eligible for the funding as long as they are P-25 Phase I compliant.

Yet in Pennsylvania, where Ridge was governor prior to moving to the DHS cabinet position, he oversaw the procurement of the state's Open Skies 800 MHz trunk system, a *non-P25* compliant system.

State and local governments themselves can also share the blame for the lack of interoperable systems. In February 2003, the National Task Force on Interoperability (NTFI) released a 104-page report that detailed why public-safety agencies are facing interoperability problems. One of the top five reasons cited was lack of coordination and cooperation in state and local governments.

"State and locals have the attitude that 'what's mine is mine.' They want their own systems. There's not just one thing holding back P25. It's the will to cooperate, the politics, available spectrum and money," said one NTFI official.

NTFI highlighted the fact that agencies are naturally reluctant to give up management and control of their communications systems. It suggests that public officials can consider sharing costs and benefits with other jurisdictions or look at sharing infrastructure such as radio towers.

The bottom line, said NTFI, is that public-safety agencies must change they way they do business, which means sometimes giving up control of their communications systems.

So which public safety agencies in the United States aren't on the P-25 bandwagon? Who cannot talk to the Feds and other vital agencies on their radio systems in times of disaster or when their citizens are under attack?

The Non P-25 Honor Roll

Agency Oakland Public Safety, CA Lakewood Public Safety, CO Coral Gables Public Safety, FL Hillsborough County Public Safety, FL Henry County Public Safety, GA State of Iowa Evansville/Vanderburgh County Public Safety, IN Terre Haute Public Safety, IN Vigo County, IN Pointe Coupee Parish Public Safety, LA St Martin Parish Public Safety, LA St Tammany Parish Public Safety, LA Allegan County, MI Livonia Public Safety, MI Oakland County, MI Harrison County/Biloxi/Gulfport Public Safety, MS Noxubee County, MS Warren County Public Safety, MS

Johnston County Public Safety, NC Albuquerque Public Safety, NM North Las Vegas City, NV Onondaga County Public Safety, NY Cleveland City Public Safety, OH Springfield, OH Oklahoma City Public Safety, OK Cumberland County, OA Lancaster County, PA Pennsylvania Statewide Clarksville Public Safety, TN Memphis Power & Light, TN Memphis Public Safety, TN Shelby County Public Safety, TN Corpus Christi City Public Safety, TX DFW Airport Public Safety, TX Live Oak City, TX Montgomery County Public Safety, TX San Antonio/Bexar County, TX City of Milwaukee, WI

Non P25 System in Use AEGIS Regular AEGIS Regular ProVoice Regular ProVoice Wide Area ProVoice Wide Area ProVoice Regular

ProVoice Wide Area
ProVoice Regular
AEGIS Regular
MA/Com OpenSky Regular

ProVoice Regular ProVoice Regular Motorola Type II Smartzone ASTRO - VSELP ProVoice Regular ProVoice Wide Area ProVoice Regular **AEGIS Wide Area Mixed** Motorola Type II ASTRO VSELP ProVoice Regular ProVoice Regular MA/Com Regular OpenSky MA/Com Regular OpenSky MA/Com Regular OpenSky ProVoice Wide Area Motorola Type II ASTRO VSELP Motorola Type II ASTRO VSELP **AEGIS Wide Area AEGIS Wide Area** ProVoice Regular ProVoice Regular ProVoice Regular ProVoice Wide Area MA/Com OpenSky Regular

Meanwhile, those pushing for more rapid rollouts of APCO-25 networks hope it doesn't take another major disaster to highlight these deployment hurdles.

We learn from history that we do not learn from history

- Georg Friedrich Wilhelm Hegel

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